# McGRAW-HILL DIGEST

ENGINEERING · INDUSTRY · SCIENCE · BUSINESS

FEBRUARY 1947

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International Review of New Developments

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# Technical Highlights of '46

**Ten most outstanding developments are discussed. Other highly significant achievements in each basic industry are listed**

Measured by technical progress, 1946 was portentous. Many of the engineering and scientific developments of the year will have important long-range influence upon industry and business. That these trend-making milestones may be brought into proper perspective, the editors of 26 McGraw-Hill technical and business publications were asked to name those developments which they consider outstanding. The 10 most important are discussed immediately below. Then follows a list by industry of other technical achievements you will want to watch.

### The Big Ten

**Atomic Power**—Three events pointed up the feasibility of generating power by nuclear fission. (1) Official estimates of the cost of such power plants were presented to the United Nations. The report asserts that a 75,000-kw. plant can be built for about $25,000,000 and operated at 8 mills per kwh., compared with 6.5 mills for a coal plant. (2) An even more optimistic report by the Carnegie Endowment Committee on Atomic Energy stated: "It appears likely that secondary plutonium reactors may produce power for 5 to 15% less than coal-fueled plants, while a large primary pile probably could sell plutonium at a price equivalent thermally to coal and still produce power at 3-4 mills per kwh. (3) Perhaps of greatest significance was the authorization to build the world's first atomic power plant—the Daniels pile—at Oak Ridge, Tenn.

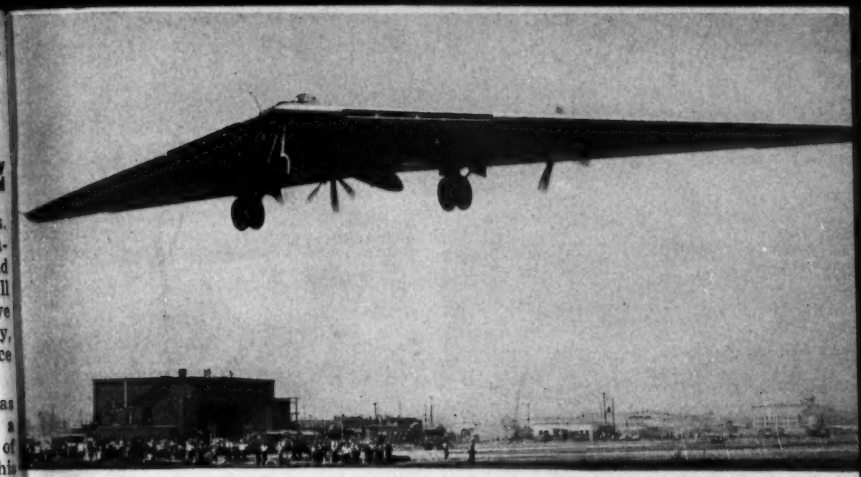
**Radioactive Isotopes**—Produced by the nuclear-fission pile, radioactive isotopes were first sold commercially in 1946. Chemically indistinguishable from the ordinary forms of the elements, these isotopes provide experimenters with tagged atoms, the course of which may be traced through the bodies of men, animals, and plants in medical and nutritional studies. In chemistry, they will speed more complete understanding of metallurgical and organic reactions. In industry they will measure flow, detect leaks, and serve other useful purposes. In cancer therapy, the relatively cheap isotopes can replace costly radium.

**Liquid Fuel from Gas**—Natural gas will be transformed into gasoline at a cost expected to compete with that of motor fuel refined from crude oil. This will be done in two large American plants, construction of which was started in 1946. Cost per gal. for one of the plants is put at 5¼¢. While Germany has made synthetic fuels from coal, the cost was much higher than that of products refined from petroleum.

**Synchrotron**—Important because of what it will contribute to the progress of nuclear physics, a new 300,000,000-volt atom smasher, known as the synchrotron, is being built at the University of California. Its power may be stepped up to a billion volts, or to the level of the energy of cosmic rays.

**Flying Wing**—Carrying 25% more than a conventional airplane of comparable size, the Northrop flying wing contributes significantly to the load capacity of aircraft and to the development of supersonic craft. The 172-ft. V-wing has a lift-drag ratio between 140 and 200 to 1, compared to 100 to 1 for wing-and-fuselage ships.

**Electronic Computer**—Expected to revolutionize the mathematics of engineering and to simplify many industrial design and development methods, the Electronic Numerical Integrator and Computer (ENIAC) is 500 times as fast as any previous calculating device. It solves in 2 hr. of computation time a problem that would take trained computers 10



Northrop "Flying Wing," one of the 10 most important developments of 1946.

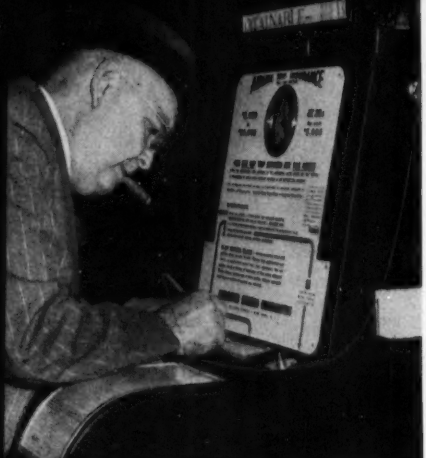
man-years. With this robot mathematician, the many complex variables involved in weather behavior may be analyzed, and accurate long-range weather forecasting achieved.

**Gas Turbine**—Such great strides were made in the development and application of the gas turbine in 1946 as to make the year a milestone in the long history of this important prime mover. It was built in Switzerland in sizes up to 10,000 kw. for economical standby and peak-load power-plant service. Perhaps of even more long-range significance was the revelation that the coal-fired gas turbine was coming, major problems having been solved. First application is to be in a locomotive, expected to be ready for rail tests next year. Other turbine developments include successful test operation at 1350°F., and a radical Swiss innovation which permits last-stage compression of air without pistons or blades. The latter gives high gas-turbine-cycle top-temperature and efficiency without requiring better high-temperature alloys than were available before the war.

**Helicopter**—It was a long time coming, but the helicopter became a safe, reliable, practical machine in 1946, and is here to stay. An Army Sikorsky R-5 has lifted 1017 passengers, and it has flown at 21,000 ft. altitude and exceeded 114 mph. Becoming useful in many businesses, the helicopter is now being sold by Sikorsky and Bell Aircraft.

**Television Progress**—Still in its infancy, television may be said to have established itself in 1946 as a practical and coming means of communication. Various developments played a part in this. Perhaps first is the RCA Image Orthicon television camera. Most sensitive camera known, it will transmit moving pictures which even the fastest photographic lenses and films cannot record, approaching the human eye in sensitivity. Another significant development was successful television in color by two systems devised by Columbia Broadcasting System and Radio Corp. of America. Particularly significant to television's immediate future was the aggressiveness of manufacturers in putting television sets on the market in 1946 and the planning for important production in 1947.

**New Structural Materials**—Coming importantly into the industrial picture in 1946, several new materials now enable the product designer to achieve new results. Outstanding are the reinforced and laminated plastic materials which can be molded into curved shapes under low temperature and pressure, these being useful in a wide range of products, including machine housings, wall panel-



**MACHINE SELLS INSURANCE**—Vending 400 air insurance policies in its first month of operation at New York Airlines Terminal, this Associated Aviation Underwriters' Insurograph sells policies ranging from $5,000 to $25,000 at $0.25 to $1.25. Insuree fills in blank through glass window; one copy is delivered to him, other is filed mechanically for company. —AVIATION NEWS

ing, furniture, aircraft, and boats. Plastic reinforced with glass fibers is tough enough for bullet-proof vests, has been tried experimentally in automobile bodies.

Strong, lightweight structural materials are made by sandwiching a filler, such as balsa wood or plastic-impregnated honeycomb of kraft paper, between sheets of wood, metal, or plastic.

In the building field, new lightweight concretes are stimulating the demand for the economical precast units.

## Other Highlights

**Aviation**—Jet-assisted take-off for commercial planes, and rocket engines for supersonic planes. Progress in jet propulsion. Ground Control Approach radar and Instrument Landing System, which came close to practical use in 1946. Martin 202 transport, highly significant speed-wise and costwise. Direct-injection engines installed in all "Constellations." Flying Pancake, "round"-wing plane which can hover.

**Chemistry**—Streptomycin produced on large scale. Penicillin G synthesized. Commercial production of fluorine gas in cylinders and development of organo-fluorides such as Teflon. Commercial manufacture of 2, 4-D and other weed killers. New syntheses for nylon and various fibers. Further development of silicones and related organo-silicon products. Wide use of new influenza vaccine.

**Construction**—Air-entrained concrete. Precast rigid-frame buildings. Building on roller bearings. Breakpoint chlorination. New applications of radiant heating. Aluminum bridge. Movable laboratory partitions.

**Electricity, Power**—Half-million-volt power transmission studies initiated. 100,000-kw. 3,600-rpm. steam turbine built; 180,000-kw. unit quoted. 2,000,000-volt industrial x-ray installed. Heat-pumps installed in electric homes. 1,000°F. superheat used in steam power plant.

**Electronics, Radio**—Automatic control of aircraft and missiles. Determination of radioactive effects of atomic explosions. Dielectric heating of plywood and foods. Cavity magnetron tube (revealed in 1946).

**Factory Methods**—Wide application of pallet system in handling materials. Adoption of statistical quality control in manufacture.

**Food Processing**—Flash freezing by evaporation in high vacuum. Synthetic production of folic acid. Fish-filleting machine.

**Mechanical Design**—Availability of high-temperature metals and ceramics. Progress in standardization. Use of aluminum and magnesium alloys as replacements for ferrous parts in industrial and consumer products. Trend toward hydraulic powering and control of industrial equipment. Injection molding of large plastic parts. Cemented steels.

**Metalworking**—Precision casting on mass production scale. Man-au-trol spacer which eliminates jigs under radial drill. Suspended carburization, permitting furnace to be charge over weekend. Commercial application of supersonic inspection. Packaged unit for lathe-slide arrangements. Direct-fire paint baking ovens.

**Mining**—Fusion piercing of hard iron ore. Commercial application of airborne magnetometer in prospecting.

**Textiles**—Stabilization of rayon fabrics. Ultra-high-speed tricot machine. Continued progress in shrinkproofing wool. Widespread application of materials handling in textile mills. Sulzer loom. Progress toward continuous drying of wool. Seamless nylons. Peacetime adoption of nylon in place of cotton tire cord. Continuous fulling of wool.

**Transportation**—Application of electronics to train and ship safety control. Two-way radio communication on trains and buses. Construction of light-weight buses. Chrome-plated piston rings. Installation of telephones in automobiles. Construction of articulated motor bus.

# Innovations at Metal Show

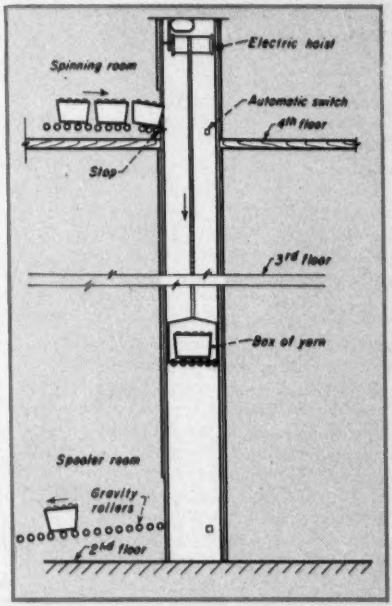
**New equipment and methods include battery flash welder, Oxyarc cutting process, powder welding, ultrasonic flaw finder, and x-ray thickness meter**

New metal-working machines and methods were introduced at the National Metal Congress exposition. Designed by Progressive Welder Co. for uniform operation, an aluminum flash welder draws 15,000 to 50,000 amp. from 8-volt storage batteries which are recharged automatically at 18 kva. Arcos Corp. demonstrated its Oxyarc process for cutting stainless and other metals. A coated tubular rod is dragged along the line of cut in contact with the work. Oxygen is supplied through the rod and an arc established between rod and work. National Cylinder Gas Co. exhibited its Shield-O-Matic electrode for automatic welding. The finedged electrode core is wound with two helical coiled wires and is coated between the wires with a continuous, seamless, tube of flux.

Powdered hard-facing alloys are applied by the new Spraywelder exhibited by Wall Colmonoy Corp., then fused by heat into a hard, nonporous layer up to .060 in. thick. Powdered metals mixed with fluxes are projected through a flame cone onto metal for welding, brazing, and surfacing by a Powder Weld Co. unit.

Several plastic coatings which can be applied by brush, spray, or dip were displayed. Two made by Seal-Peel, Inc., and Progressive Systems, Inc., are used as protective coating during shipping and storing of metal parts and products. A thin material developed by Better Finishes & Coating, Inc., aids processing operations. Work can be formed or drawn as much as 7 in. without rupturing the coating, which prevents die marks and protects work from scratches or weld spatter in subsequent operations.

Internal defects too fine to be shown by x-ray are revealed by the ultrasonic tester introduced by General Electric X-Ray Corp. The ultrasonic waves are transmitted through the material under water, and a flaw affects the signal that is picked up and registered on a meter. Thickness of moving material is checked by x-rays with the Measuray exhibited by Sheffield Corp. The x-ray signal passing through the work is compared with a signal passed through a standard sample; the difference registers as percentage variation. —AMERICAN MACHINIST




"DUMB-WAITER"—Moving warp yarns from 4th floor spinning room to 2nd floor spooler room at Avondale Mill is done by this "dumb-waiter," making 40 trips per hr., saving $50 a day. Warp yarn boxes are placed on gravity rollers by doffer, a raised-bar obstruction stopping boxes at elevator door. Rising car raises bar, and boxes roll onto waiter; automatic switch controls waiter's descent. Reverse operation is employed at spooler-room landing. —TEXTILE WORLD

# Food Frozen by Evaporation

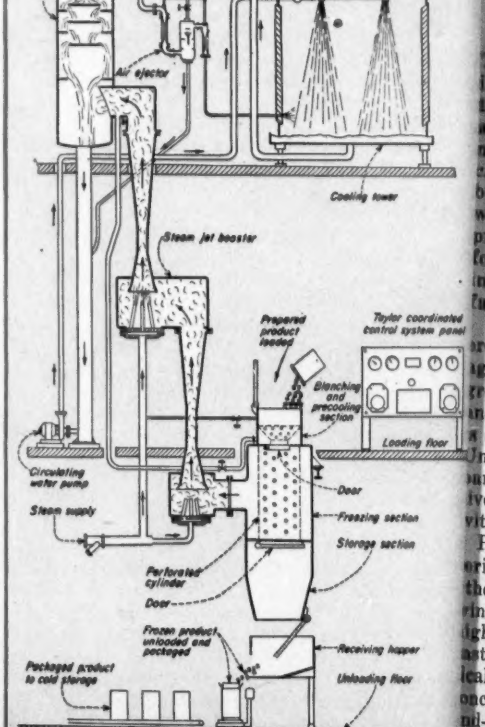
**New, economical, "flash freezing" process for bulk foods remove heat by vaporization of moisture from product under a high vacu**

Foods now are flash frozen in a high vacuum by rapidly evaporating part of the moisture content of the product. Individual pieces freeze without sticking together. Original volume is retained although there is about 25% weight loss due to water evaporation. There is no formation of frost on the equipment.

By flashing to vapor 13.4 lb. of the water on, and in, 100-lb. of blanched peas, the product is cooled from 212°F. to 32°F., leaving 86.6 lb. of precooled peas. Vaporizing another 8.7 lb. of water freezes the peas at 32°F. leaving a product weight of 77.9 lb. (For simplicity, freezing point of peas is taken as 32°F.) To further cool the frozen food to 0°F., ice is sublimed from the product, reducing weight to 77 lb.

Any large-capacity, high-vacuum device theoretically will accomplish flash freezing. One system which has proved qualitatively and economically satisfactory is the Ingersoll-Rand "Freez-Vac" freezer. Direct evaporative freezing is produced by a high vacuum created by a steam-jet ejector system. Heart of the system is a steam-jet booster consisting of several nozzles discharging steam jets at velocities of 3,500 to 4,250 fps. across a suction chamber and through a venturi-shaped compression tube. Water vapor from the freezer enters the booster, is entrained in the steam jets, and discharged through a throat, whe velocity is converted to pressure. T mixture is thus compressed and d charged into the condenser at a relative lower vacuum; for efficiency, condens vacuum must be as high as possib

Diagram of new flash-freezing process, including steam-jet vacuum syste



Barometric condensers are used, giving countercurrent direct contact of cooling water with the booster exhaust.

The Freez-Vac includes blanching and precooling, freezing, and storage sections. After a batch of prepared vegetables has been dumped into the unit, the operator pushes a button, the loading door closes, and coordinated automatic process controls direct blanching, precooling, and freezing. When freezing starts, a second batch is admitted for blanching and precooling. After the product is frozen, the batch is dropped into a storage chamber which can hold four frozen charges. While precooling any charge, the storage chamber can be opened to remove and package the food.

First application of the Freez-Vac has been for freezing material to be used in commercial reprocessing.

The process has proved economically sound, and technologically capable of producing frozen products entirely different from those obtained by other freezing methods. —FOOD INDUSTRIES

# Britain Builds Homes Faster

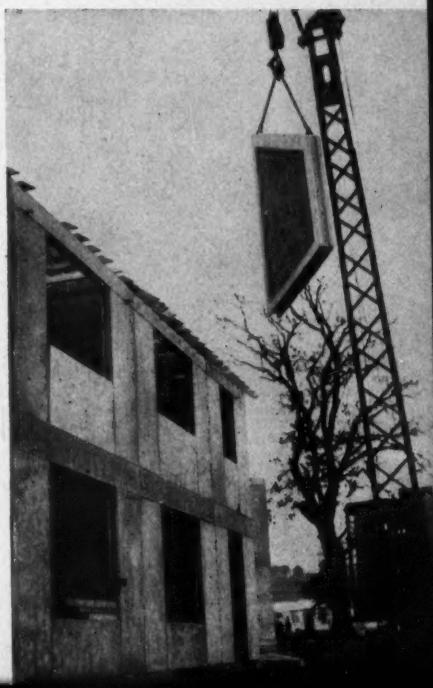
**Contractors try unconventional construction methods to speed housing program. Monolithic, porous, and precast concretes used**

To speed the housing program, Britain is trying some unconventional construction methods. Eight blocks of 4-story apartments in London will be built 8 months ahead of schedule by the so-called monolithic concrete system. The buildings are a series of concrete cells, with all walls made by erecting soundproof and insulating boards with scaffolding as forms, then pouring concrete in place. The forms remain as wall surfaces.

Multiple family houses are being erected of porous concrete, made of large aggregate and cement, without fine aggregate. This serves both as structural and insulating material. Exterior finish is stucco, and inside walls are plastered. Unusual forms are used—trussed open panels sheeted with screen wire. Relatively light, large panels are handled with a crane.

Precast concrete panels, in both exterior and partition walls, represent another type of construction. Except for window openings, panels are one story high. After being placed, the panels are fastened together by rods set in the vertical joint grooves and then packed in concrete. Horizontal joints are tongue-and-groove. —CONSTRUCTION METHODS

Crane lifts grooved precast concrete panel into position in new type of British house construction.



## BALL-POWDER PROCESS UPSETS TRADITIONS

Upsetting traditional processes in the explosives industry, the new ball-powder method of Western Cartridge Co. takes only about one-fifth the conventional time and is less hazardous, being conducted under water until the final drying stage. The powder itself consists of closely sized spheres instead of the conventional extruded grains, can be controlled readily in size and density, has superior stability against aging, and produces much less muzzle flash.

Ball powder starts with cellulose nitrate, which is charged as a slurry into a still where it is dissolved in ethyl acetate, stabilized with diphenylamine and neutralized with chalk. If desired, a solution of nitroglycerine is then added, after which the "lacquer" is dispersed into small spheres or balls by adding a protective colloid and stirring under controlled conditions. The solvent then is boiled off (and recovered), thus hardening the balls, after which their density is regulated by osmotically removing part or all of the water. The powder is now screened into several size fractions, which are coated individually with a deterrent to control the burning rate. Coating is accomplished by suspending the powder in water in which a plasticizer has been emulsified.

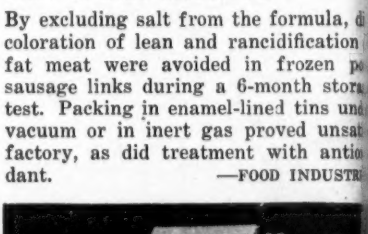
Final operations include rolling of oversize ball powder to decrease its web thickness, followed by centrifuging or filtering for unrolled powders. Drying is by infrared heat, which is followed by screening, coating with graphite, and blending. —CHEMICAL ENGRG.

## FOOLPROOF COLOR FILM

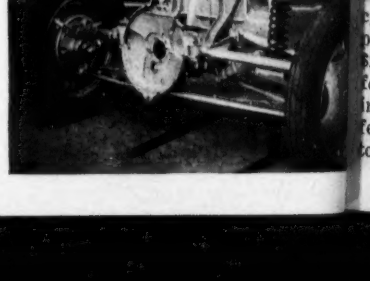
Ektachrome color film, developed by Eastman Kodak Co. to meet the variable conditions of aerial photography, will reproduce basic hues faithfully even though subject is in shadow, and it can be developed in 90 min. in home developer. Ordinary light can be used in dark room after first 19 min. of develop ing. Film should be dried in frames, a emulsion damages when wet; ima acquires brilliance as it dries. Ordina studio light is sufficient to bring o natural color. —SCIENCE ILLUSTRATI

## SALT SPOILS SAUSAGE

By excluding salt from the formula, di coloration of lean and rancidification fat meat were avoided in frozen po sausage links during a 6-month stora test. Packing in enamel-lined tins und vacuum or in inert gas proved unsat factory, as did treatment with antio dant. —FOOD INDUSTR



ECONOMICAL AUTOS—Radical French motor cr signs save weight and fuel. Smallest are 6.6-hp. T (above) and 1-cyl. Julien runabout. Three-wheel M has 310-lb. spot-welded body frame unit with st aluminum-alloy skin. Its front drive (below) usi minum in wheels, brake drums, steering column and d disk, the assembly being anchored to a heavy t Mathis flat twin engine is combined with clutch, ge and differential in aluminum-alloy housing. The A irat has four flat twin cylinders, block and head a minum, housing of magnesium. The 3-place, 90-in. w base, 1,050-lb. coupe uses a magnesium-truss fram ered with aluminum sheets. Claveau's 85-hp. V-8 m single aluminum casting for block, clutch housing, ge and differential. —AMERICAN MACHI



## PROCESSES MAY LOWER COST OF LAMINATED PLASTICS

To put laminated plastics into low-cost, high-speed manufacturing field, in competition with sheet metals, Owens-Corning-Fiberglass Corp. is testing new methods of processing. In one method, powdered resin is sprinkled on conveyor-borne glass fibers, ½ to 3 in. long. The mixture of fibers and resin then is sucked into a perforated form, covered with a paper or cellophane separator, and placed in oven to bond resin and fibers. After heating, preform is put into mold, additional resin is applied, and the material is shaped with flexible male and female molds. Final curing is the same as in conventional processes.

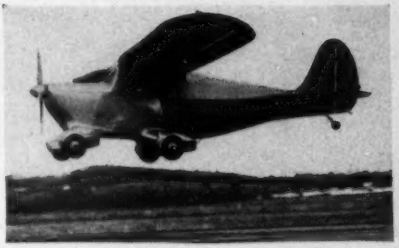
In another process, fibrous glass mat is presaturated with polystyrene resin and subjected to heat and pressure. The impregnated sheets are formed in a steam-heated female mold with a neoprene male plug. As press closes, bulge on male plug makes contact with center of female mold, flattening out as pressure increases. Pressure, working from bottom up sides of mold, squeezes out air and excess resin. —BUSINESS WEEK

## STEAM-BLAST PULVERIZER

Coal is pulverized by self-abrasion in a blast of 750°F. superheated steam by a new machine, the only moving part of which is the screw-feed. Steam consumption is about 0.6 lb. per pound of coal. Five of these Blaw-Knox units can pulverize 15,000 lb. of $5 coal per hr. at an estimated 4c a ton. —ELECTRICAL WORLD

## HIGH-FIDELITY MUSIC

Frequency response within plus or minus 1 db over the range from 50 to 14,000 cycles is achieved by the new London Reproducer phonograph, priced at $1,495 to $2,500. The amplifier circuit contains four stages of pushpull triodes. A low-impedance, 27-gram, armature pickup feeds via bass-compensating R-C circuits to the grids of two 6J5 triodes. After passing through a second set of 6J5's, the signal is fed through a compensated twin volume control to another pair of 6J5's which are capacitively coupled to the grids of two PX25 output tubes. One model has three 12-in. pm loudspeakers, the other has six. —ELECTRONICS



AIR AUTO—Convertible into an automobile in 7 min., this 150-hp. aluminum-bodied "Airphibian," built by Continental, Inc., cruises at 125 mph., lands at 55 mph. Ground speed of auto is 45 mph.; gas consumption, 25 miles per gal. In air, plane cruises 400 miles on 30 gal. of gas. Wing span is 33½ ft., overall size of coupe. 7x4½ ft. —AVIATION NEWS

## CONTINUOUS-FULLING MILL

With the continuous-fulling mill designed by James Hunter Machine Co., one man can tend one mill running eight strings of cloth with short fulling time, or two mills running fabric requiring longer longer fulling time. Two sets of rollers operate in opposite directions, top rolls being mounted on pivot beam and bottom rolls turning on fixed axis. Sets cannot engage simultaneously. Pneumatic cylinders actuate traps and pivot top rollers, one set gripping cloth. Surface speed of the roller is reported to be as high as 200 yd. per min. —TEXTILE WORLD

# Coming in Power Plants

**Greatly improved, efficiencies will go still higher. Increased temperatures and pressures, mercury boiler, gas turbine, and atomic power will contribute**

In the best power plants, coal consumption has been reduced to about ¾ lb. per kwh., and the U. S. average is 1¼ lb., compared to 6 lb. 45 years ago. The 30-40% reduction in last quarter-century was achieved as follows:

1. 10% by increasing pressures from 200 to 1,200 psi.
2. 10-14% by raising initial temperatures from 600 to 950° F.
3. 6-8% by multistage regeneration feedwater heating.
4. 2-6% by reheat cycle (used occasionally).

Trend to higher pressures and temperatures continues. One 100,000-kw. plant under construction will use 1,250 psi., 1000°F. This will be a tandem-compound, 3,600-rpm., unit with double-flow, low-pressure turbine. Another plant of same rating is being designed for 1,500 psi., 1050°F., also tandem compound but with triple flow, low pressure. In design stage, too, is a 145,000-kw., 2,000 psi. unit with initial temperature of 1050°F. and reheat to 1000°F. This will be a cross-compound design, with double-flow exhaust. It promises to be the most efficient installation in the U. S.

One of the developments of recent years which has permitted designs for high pressures and temperatures is the large 3,600-rpm. turbine with shell and rotor diameters only half those of the older 1,800-rpm. machines. This has eased shell-bolting expansion and other design problems.

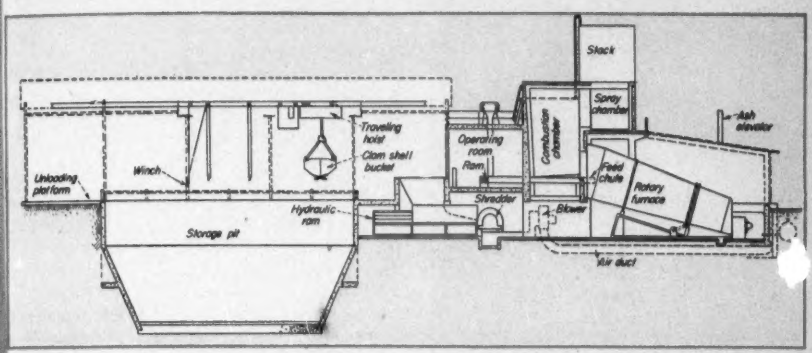
To permit further progress, metallurgists are seeking materials suitable for continuous operation at 1200°F. and higher. New variable-angle-stage turbine designs will smooth steam flow, raise efficiency. But any future major reduction in fuel consumption must come through improvements or changes in the heat cycle. Additional mercury installations are foreseen. Developments in mercury boiler will reduce first cost.

A big future is ahead for the gas turbine. In two or three decades, production of electrical energy from atomic energy will be an important factor. —POWER

## LIGHTWEIGHT TROLLEY BUS

Weighing but 17,230 lb., the 44-passenger Marmon-Herrington TC-44 trolley bus has aluminum and corrosion-resistant high-strength steel in frame, the lighter weight giving an estimated saving of 0.65¢ per mile. Outside sheets, inside walls, and roof serves as stress members, forming a double-walled box girder on all sides to increase strength. Interior panels are pressed out to give extra 2 in. of seat space. —BUS TRANSPORTATION

EASY TO MAKE AND PUSH—Magnesium-alloy Lawn barrow weighs but 12 lb., is made with only three machines. One 75-ton hydraulic press with gas-heated clamping and draw rings shapes 0.072-in. hot magnesium sheet over male die to form 27x31-in. hopper of 8.5-in. max. depth. Special die design and 50-ton clamping press avoid wrinkling. A second hydraulic press rolls edge of hopper. Legs and braces, of ¼x1¾-in. extruded Mg alloy, are bent conventionally in 10-ft. brake. Handles are hot-formed in gas-heated bending fixtures while tube is wet. Legs are riveted at cross; four bolts attach legs and handles to hopper; the fifth bolt holds the wheel and also serves as an axle. —AMERICAN MACHINIST




**LABOR-SAVING INCINERATOR**—Four rotary furnaces, with 5-ton-per-hr. capacity each, will be used in the new Los Angeles combustible-rubbish disposal plant. Operation will require only 6 men; old system needed 30. Operable as single unit, each furnace is in shape of cone frustrum, 32 ft. long, and is lined with 9 in. of refractory brick. Inside dia. is 11 ft. at inlet end, 7 ft. at outlet; slope is 15%. Rubbish, cut by rotary blades in 1½-in. max. lengths, is retained in furnace about 75 min.; the max. temperature is 1600° F. Two traveling clamshell cranes carry rubbish from storage pit to hoppers; hydraulic rams push it to shredders of 15-ton-per-hr. capacity. Drag conveyor moves shredded material to furnace. Oil brings furnace to operating temperature for high-moisture rubbish. At outlet end of furnace, clinker-free ash is dumped into quenching trough; drag conveyors move it to collection pit. —ENGRG. NEWS-RECORD

## TWO WAYS TO MAKE BUTTER CONTINUOUSLY

Two continuous processes for making butter have been developed in the United States. The Cherry-Burrell method involves concentration of cream in a separator to 86-90% butterfat, flash pasteurization at 190-200°F. for a few seconds, and cooling to 110-115°F. Then the fat is "standardized" by addition of salt and neutralizer (when required); color and starter are added if desired. Finally, the butter mix is pumped through a chiller, resembling a continuous ice cream freezer, and butterfat is crystallized. After additional working in a texturator, butter is extruded at 48°F. ready for printing and packaging. The product is said to have a very compact body.

In the Creamery Package process, the cream is neutralized, pasteurized, and held in conventional way. Then it is heated to 170°F., concentrated in a separator to 75-80% fat content, and passed through an emulsion breaker, or "homogenizer." Fat and serum then are separated by stratification, and the 98% hot liquid fat flows to two cylinders of a triplex piston pump. A salt-water solution flows into small third cylinder of pump, and mixes with fat in the discharge manifold. Now the 140-150°F. mixture passes through a chiller — an adaptation of a continuous ice cream freezer—which solidifies the fat and works the mass to attain smoothness of texture. The butter is extruded as a bar at 45-55°F. and is cut into print length and packaged. —FOOD INDUSTRIES

## BOMB SIGHT LANDS PLANE

The bomb-sight principle is used in reverse to land light planes and commercial airliners from altitudes up to 500 ft. with a new instrument made by American Gage & Mfg. Co. Pilot sets dials for glide speed, wind velocity, and load, then watches approach through glass optical system. When projected dot on glass reaches landing point, engines are cut and the plane glides to a stop within plane's length of predetermined point. Instrument weighs 5 lb.—AVIATION NEWS

HOT LAMP—Concentrating 1,500°F. at one point, this 110-volt Westinghouse Co. infrared bulb will generate sufficient heat to light a cigarette, but may "sun burn" your nose. —BUSINESS WEEK

## SAVES $280 A DAY

To pull electric cable into or out of conduit, Los Angeles Dept. of Water & Power has put into service a trailer-mounted, gasoline-engine-driven steel pulling reel. Cable up to 3⅜-in. O.D. can be handled at 3 to 40 ft. per min., and the reel (5 ft. in dia., 4 ft. wide) holds more than 800 ft. of 138-kv., single conductor, 1,500,000-cir. mil., oil-filled, lead-covered cable. Two oil reservoirs can be attached to oil-filled cables to keep them under pressure and free of air and moisture during pulling. Reel is driven through worm gear and sprocket by 462-cu.-in.-displacement engine. Operating cost with the crew is $170 a day for work that would have cost $450 with former cable-pulling trucks. —ELECTRICAL WORLD

## ELECTRICAL COMPUTOR SOLVES WING-FLUTTER PROBLEMS

To make the complex, time-consuming mathematical computations involved in solving aircraft wing-flutter velocities, Ohio State University has developed an electrical analogy computor. Its operation is based upon the analogy existing between the equations of performance of the mechanical elements (mass, stiffness and velocity damping) and the electrical elements (inductance, capacitance, and resistance). Instability of the analogous electrical circuit is directly related to the vibrational instability of the aircraft wing and its associated airstream. As the circuit elements are adjusted, the circuit will break into self-sustained oscillation. Flutter velocity of the wing then can be calculated quickly. —AVIATION

## SCIENCE IN TOYS

Wartime research and applied science has entered the childrens' toy manufacturing field. A jet-propelled, die-cast, racing automobile powered by a carbon dioxide cartridge suspended under rear axle is made by Cox Mfg. Co. . . . George Jue Co. has developed a 13-lb. duralumin bicycle with an adjustable rubber-fabric drive belt which acts as a governor to "control" speed . . . Activated in the same manner as a top, Howard Crawford Co.'s plastic and aluminum toy helicopter uses a wire rotor band as a flywheel. It will rise over 100 ft., circle, or fly forward . . . Actuated by electronic equipment inside drum, a doll, mounted atop drum, dances to music. It is a product of Radio Frequency Labs. . . .Vinylite building set of blocks and pins, made by Du Page Plastic Co., permits child contractors to erect houses merely by fitting pins into perforated base and slipping on blocks. Structures may be varied in size and shape. . . .Using a magnetic field to control ball hung from overhead support, two people play tenpins by pushing buttons. Buzz-ball tenpins is made by Electronic Labs. —SCIENCE ILLUSTRATED

# Synthetic Fuels Promising

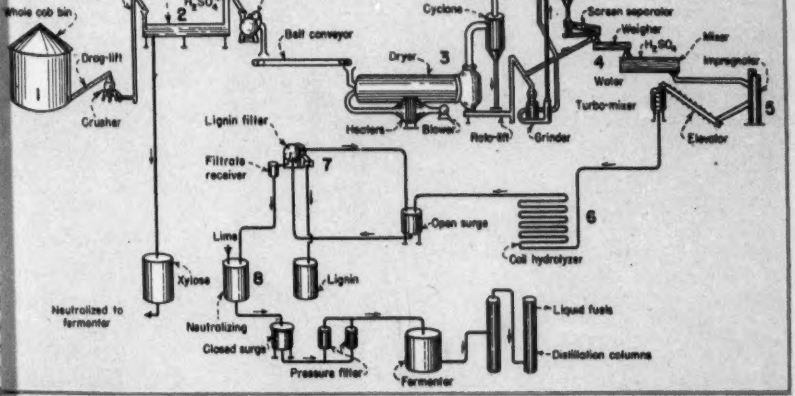
**Expected to compete on cost basis. Large plants will transform natural gas into gasoline. Progress made in converting coal to oil and gas**

There is ever increasing confidence that the synthesis of motor fuels from natural gas is feasible, not only from a technical but from an economic standpoint. Large commercial plants to make such fuels will be built by Carthage Hydrocol, Inc., and Standard Oil Co. of Ind. Other oil companies, too, are considering installations.

These companies expect that the cost of the synthetic motor fuel will be at least competitive with that of gasoline from crude oil. Predicted cost of gasoline from one of the plants will be 5½¢ per gal. Capital charges represent about 50% and raw material costs about 20% of this figure. When the plants have a successful performance record behind them, allowing a reduction in the capital charges of future plants, the raw material costs could conceivably double or treble without weakening the competitive position of the synthetic products.

The engineering responsible for this advance in the synthesis of oil was learned in America during the war. Two new techniques were outstanding: (1) the use of the "fluid bed," and (2) the production of cheap chemical oxygen. Both of these techniques can be applied to the synthesis of oil from coal.

In 1943, the cost of making oil from coal by high-pressure hydrogenation was placed at 16 to 18¢ a gal. Recently, a



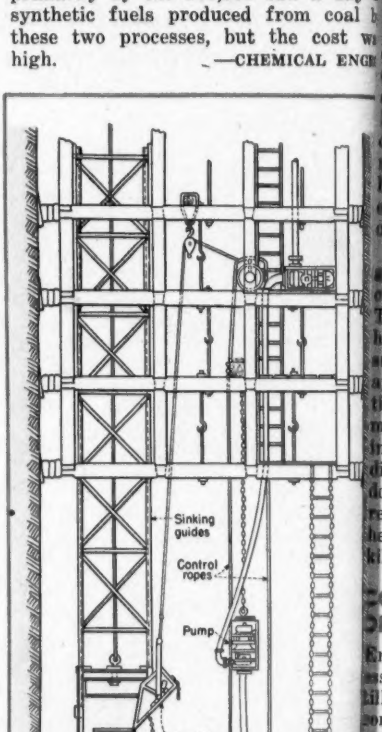

FUEL FROM WASTE—In a semi-works plant of the U. S. Dept. of Agriculture, 500 gal. of alcohol daily can be made from farm residues. Corncobs are crushed and fed into a pentosan hydrolyzer. Ligno-cellulose material from the hydrolyzer is dewatered, dried in a steam-heated rotary drum, and ground to pass a 20-mesh screen. The material is then mixed with sulphuric acid (85%) and the cellulose degraded in an impregnator. The acid-ligno-cellulose is mixed with water, pumped through a coil hydrolyzer, the hydrolyzed lignin removed by a rotary filter, and the acid neutralized with lime. Pressure filtration, fermentation, and distillation complete the process. From 90 to 95 gal. of motor fuel is expected from each ton of residue. —CHEMICAL ENGRG.

major oil company indicated that with a "mine-mouth" coal cost of $2.50 a ton, motor fuel could be produced for 7 to 10¢ a gal. Estimates by Hydrocarbon Research, Inc., indicate a possible cost of 6.5¢ per gal. with coal at $2 a ton. This figure is competitive with the cost of motor fuel from crude oil.

Concurrently with advances in the synthesis of oil from coal and gas, extremely important advances have been made in the conversion of coal into gas. The Lurgi Co. of Germany in 1936 placed into operation its first high-pressure coal-gasification plant to produce directly from coal—without oil gas for enrichment—a gas suitable for town use. The process is relatively simple. By means of a lock-hopper system, brown coal is fed semi-continuously into the top of an open chambered vessel, suitably insulated and maintained at a pressure of about 300 psi. Into the bottom of the vessel is fed a mixture of steam and oxygen. By incomplete combustion, the coal is gasified, some oil being recovered as a byproduct. Technically the process has been a great success. The most recent Lurgi installation at Most, Czechoslovakia, produces 570-Btu. gas, and thermal efficiency exceeds 80%. With the removal of some obvious bottlenecks, this installation could produce 15,000,000 cu. ft. of town gas a day directly from low-grade coal.

American engineers are expected to improve materially, and lower the cost of, coal gasification. There is no basic reason why a highly coking, relatively inactive bituminous coal cannot be gasified to yield a gas of 900-950 Btu. with a thermal efficiency of 80% plus. Development work to achieve this already is under way. Predicted operating cost is about $1 a ton.

Production of synthetic fuels has been going on for about 20 years, much of the original work being done in Germany, including high-pressure hydrogenation and the Fischer-Tropsch process. The German military machines were fueled primarily by the 100,000 bbl. a day of synthetic fuels produced from coal by these two processes, but the cost was high. —CHEMICAL ENGR.




SPEEDY SHAFT SINKING—Replacing conventional buckets with mucking pans increased monthly advance speeds from 31 to 118 ft. at the Spokane shaft and to 145 ft. at the Turayoq shaft on the property of San Manuel Mining Co. Diagram shows how mucking pan was operated. Hoisting was done in end compartment, long enough permitting lowering of cage below last set of timber. Mechanical mucking could proceed when bottom was as much as 45 ft. below the last set. Short guide shaft on one side of cage provided room for direct dumping. 4 ft. 6 in. by 2 ft. 6 in. by 2 ft. mucking pan, filled by mucking and operated by rope-controlled air hoist, located at 100-ft. intervals and connected in series. Sump pumps remove water. —ENGRG. & MINING JOU

## RUSSIAN CANCER RESEARCH MAY HAVE LEAD TO CURE

KR, a serum that has killed cancerous cells in mice and has been partially successful in treatment of humans, has been developed by Drs. Gregory Roskin and Nina Georgiyevna. Successful in 90% of laboratory-produced cancers in 13,000 mice, the serum has been tried on 60 human patients, cancers disappearing in eight cases and growth being arrested or diminished in ten.

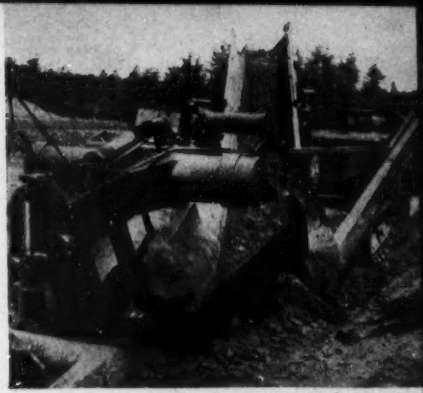
Serum is prepared from blood of guinea pigs injected with *Trypanosoma cruzi*, a parasite causing Chagas' disease. Trypanosomes tend to concentrate in heart, connective, nerve, and gland tissues; through microscopic study they appear more concentrated in cancerous tissue than in healthy tissue. KR remains potent for 10-12 days, but must be increased in potency, as rate of cancer disappearance depends on potency of dose. At the same time, rate of cancer reduction must be controlled to let healthy tissue replace the diseased tissue killed by serum.—SCIENCE ILLUSTRATED

## CONTINUOUS SEPARATION OF FATTY ACIDS DEVELOPED

Emery Industries has developed a process for the continuous separation of distilled fatty acids into solids and liquid components. It consists essentially of controlled crystallization of solid fatty acids from polar solvent medium, permitting a sharp separation in a single stage. The solvent is separated from the stearic and oleic acids by distillation and returned for reuse.

In commercial operation, the distilled fatty acid mixture is disolved in methyl alcohol, along with a crystal promoter. This solution is chilled in a multi-tubular agitated crystallizer, resulting in a slurry containing stearic acid crystals. The mixture is separated on a continuous rotary filter with cold alcohol to remove adhering liquid acids. Then the filter cake is melted and transferred to a still where the alcohol is removed and returned to the start of the process. Stearic acid is discharged as a final product.

Filtered oleic acid solution is pumped through an economizer and then to a still where the solvent is recovered. Oleic acid is discharged in commercial grades suitable for industrial application. Distillation, washing, and bleaching will produce extra quality. —CHEMICAL ENGRG.



**DIGS AND LOADS**—Excavating to a maximum width of 9 ft. in highway finishing operations, this Euclid Road Machinery Co. loader carries excavated material up a 54-in.wide belt to loader 10-ft. above ground. Clearances permits uninterrupted truck loading. A 150-hp. diesel engine furnishes power for lift, also operates hydraulic hoist controlling cutting depth. Unit is pulled by 110-hp. tractor, and a tractor-drawn rooter precedes loader to scarify roadbed. On highway project, 13-cu.-yd. bottom-dump wagons worked with loader; 230,000 cu. yd. was moved in a month. —ENGRG. NEWS-RECORD

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Iron powder is to be reclaimed by the Firth process from iron carbonate slate which overlies much of Minnesota's iron ore formations. Dilute sulphuric acid will dissolve out ore, precipitating it in iron sulphate crystals. Roasting produces iron oxide which then is reduced to iron powder, 99% pure. The powder is compressed at 50 tons per sq. in. and heat treated at 2000°F. Ratio of iron to slate is 1:10.

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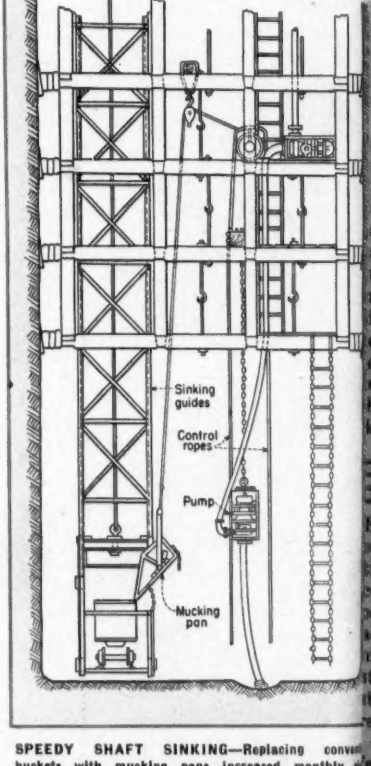


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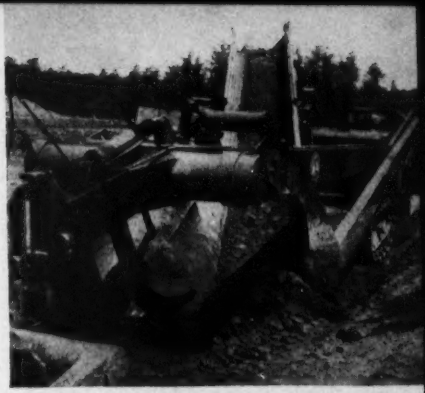

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# TECHNICAL SHORTS

**Water Supports Roof**—Pivoted cantilver beams, 51½ ft. long, with a war surplus pontoon unit as a counterbalance, supported the nave and transept of a cathedral under repair while masonry under the timber trusses was removed and replaced. Water was added to 5x7x5-ft. pontoon until balance permitted sliding a sheet of paper between bearing points of trusses. —ENGRG. NEWS-RECORD

**Oils Where Needed**—Adding lubrication to center drag-rail of a 6-ft.-wide conveyor apron cut motor load and maintenance at Truax-Traer Coal Co. mine. Although conveyor was designed for dry operation, a ¾-in. pipe, with oil drip holes, was set in groove along center of wooden rail support. Pipe is fed by gravity. —COAL AGE

**Dries Lumber Quickly**—Having reduced drying time for 4x4-in. pine from 96 to 27 hr., Western Pine Association is experimenting with spraying lumber with dehydrating agents, such as acetone, in hopes of cutting time to 4 hr. Repeated spraying with fresh solvent will reduce water content of lumber to 3%. —SCIENCE ILLUSTRATED

**Vulcanizer Saves $10,000** — Surface-chafed pressurized sparkplug cables are salvaged by Eastern Air Lines. Damaged section is wire buffed for cleaning and tapering, wrapped with 1/32x1-in. uncured rubber, then simultaneously vulcanized and molded in an electric vulcanizer. Estimated savings are $10,000 yearly. —AVIATION

**Chemical Improves Electrical Brushes**—Carbon brushes for electrical motors and generators operate more efficiently in many applications when chemically treated so as to repair continuously the copper oxide surface film. Commutation is not improved when machines operate in atmospheres laden with abrasive particles or in corrosive atmospheres. —ELECTRICAL CONTRACTING

**Stress Pits Gears**—Pitting of gears is a fatigue phenomena, the occurrence of which can be related to the magnitude of the surface compressive stresses. —PRODUCT ENGRG.

**Adjustable Auto**—As many as nine passengers can be accommodated, or more than 6 ft. of luggage space provided, in the DeSoto Suburban. The 139½-in.-wheelbase car has three full-width seats. The front and center ones are adjustable; rear one folds down to become part of floor. A rack atop car augments luggage capacity. —AMERICAN MACHINIST

ROCKER-PLACED WALLS—Side walls of prefabricated houses, weighing about 48,000 lb., are positioned by this steel rocker, resting on basement floor. High early-strength concrete walls are cast on rocker; when dried they are rocked into place. Basement walls are 8 in. thick, upper walls, 4 in. Windows and door openings are precast. Houses will cost about $10,000.—ENGRG. NEWS-RECORD

**Ball Burnishing Saves 90%**—Bores of SAE-4620 steel bevel gears for Massey-Harris tractors are burnished with carbide balls at about 1/10th the cost of internal grinding. Gear blanks are rough-reamed to 1.237-in. bore dia., then 1.246-in. dia. ball is pressed through bore. After ball passes, bore shrinks to 1.242 in. —AMERICAN MACHINIST

**Motor for Airplane Wheels**—Motors weighing but 15 lb. have been designed to give prelanding rotation to Lockheed Constitution wheels. Actuated by lowering of wing flaps, motor will bring wheel rotation to within 5% of landing speed in 2 min. One motor is mounted in each of plane's eight wheels; armatures and field units are integral parts of wheel. —AVIATION NEWS

**Salvages Loom Crankshafts**—Worn loom crankshaft ends can be salvaged, according to Linde Air Products Co., by cutting between the two throwing arms, reversing ends, welding worn end to middle shaft section, and machining weld. —TEXTILE WORLD

**Steams Yucca Fibers**—A steam gun invented by R. S. Chapman converts green yucca leaves into fiber for use in paper production, cutting processing time from 72 hr. to a matter of minutes. Fibers are washed and dried after steaming. Gun is claimed to work equally well on ramie fibers. —BUSINESS WEEK

**Permits Overmodulation**—Addition of a balanced-modulation circuit to an AM radiotelephone transmitter permits modulation in excess of 100% without causing adjacent-channel interference. This increases the energy in the intelligence-bearing sidebands and delivers louder and more reliable signal to the receiver. —ELECTRONICS

**Efficient Parts Washer**—Trans World Airlines has installed a new cleaning system to speed engine overhaul. Stacked in baskets or hanging on hooks suspended from overhead chain conveyor, engine parts move continuously through 8-stage cleaning in a 300-ft. tunnel in about 9 hr. With this washer, 3 men do the work done by 40 with the old vat system. —AVIATION

**Kryocide Saves Peanuts**—To save 80% of the South's $150,000,000 peanut crop from velvet bean caterpillars, southern farmers rushed in 3,600,000 lb. of kryocide, a cryolite derivative, by air and truck. Crops were dusted by airplane, and within 60 hours, devastation had been halted. —SCIENCE ILLUSTRATED

**Haul 1,000,000 Yd. a Month**—Using 75 hauling units, some of 33-yd. capacity, two contractors are moving a million yards of fill a month to San Francisco Municipal Airport from borrowpit 3 miles away. Contract price is 62.3¢ per yard. Six electric 6-yd. shovels load the vehicles. —CONSTRUCTION METHODS

**10,000 Welds Make Trailer**—High-payload, stainless steel trailers are assembled by time-saving "shot" and resistance welding in Freuhauf plant, 10,000 welds being made. Vertical posts and cross members of body are Z-bars. Sides are sheets with corrugations flattened to take welds. —WELDING ENGINEER

**Radio Controls Plow**—Equipment used for radio control of the "Queen Bee" target plane for antiaircraft gun practice has been adapted to an English farm tractor. —ELECTRONICS

**Solves Pump Problem**—End thrust in a centrifugal pump used in a Central Mexico gold-silver mine pulled the impeller against the casing. Trouble was corrected by connecting a ½-in. bypass from suction pipe to casing on opposite side. —ENGRG. & MINING JOURNAL

**Crystal Coffee**—National Research Corp. will make instant coffee in crystal form by a high-vacuum, low-temperature process. Soluble in hot or cold water, the coffee is claimed to be rich in flavor. —BUSINESS WEEK

**Cavity Aircraft Antenna**—To minimize wind resistance, an antenna has been designed to fit into a 3x6x10-in. recess on the belly of an airplane. For 75-mc. marker beacon reception, it is essentially a shunt-excited element 9 in. long, tuned to quarter-wave resonance by a capacitor. —ELECTRONICS

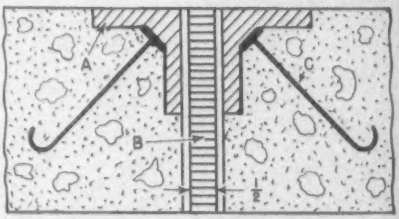
**Cuts Welding Costs**—By preheating formed strip to 2000° F. under a production line of gas-air burners, tubing is welded from hot-rolled instead of cold-rolled stock at substantial saving in welding costs. An expensive edge-trimming operation is eliminated also. —WELDING ENGINEER

**Tight Concrete Stave Tank**—Completely waterproof, precast, concrete stave tanks of novel construction have been developed by Mark Lintz. The reinforced staves are gasketed along vertical joints by wooden splines and along horizontal joints by an asphalt gasket with a ½-in. spacer ridge. Hoops placed over battens at joints hold assembly together. —CHEMICAL ENGRG.

**Radio to Reduce Truck Mileage**—Two-way radio will be used on electric materials-handling trucks at a Westinghouse plant. Radio dispatching is expeced to save many of the more than 700 miles traveled a day by 17 trucks. —ELECTRICAL WORLD

**Designed for Production**—By modern design, Glenn L. Martin has eliminated many small riveted clips, gussets, ribs, and other details from an aircraft radio-access door. Flat outer sheet is spotwelded to stiffener "sheet" with peripheral and diagonal U-shaped "ribs" formed under die pressure. —AVIATION

**Two New Cures**—"Polyporin," antibiotic derived from Indian mushrooms, has been used to treat cholera and typhoid in India . . . Russian scientists have used "colistatin," obtained from soil bacteria, to combat relapsing fever, typhoid, dysentery, and pneumonia in mice. —SCIENCE ILLUSTRATED




**TOUGH CONCRETE FLOOR**—Corners of expansion joints in the two-layer concrete floor at Lee Rubber & Tire Corp. plant are 2x2½-in. angles (A) packed with precast standard asphalt felt (B), eliminating chipping or rutting by truck wheels. Steel anchors (C), welded to inside of corners, are placed at 3-ft. intervals. Load slab is 1:2:4 mix, using 1½-in. stone; depth of slab is determined by load to be carried. Wearing slab is 3 in. thick, mixed 1:2:3½ using 1-in. stone. Reinforcing 6x6-in. wire mesh is laid 1 in. below surface, cut every 40 ft. for expansion joint. Wearing slab should be poured within 24 hr. of load slab to permit slight adhesion; any section of floor can be replaced easily. —FACTORY

# Sugar from Fruit Waste

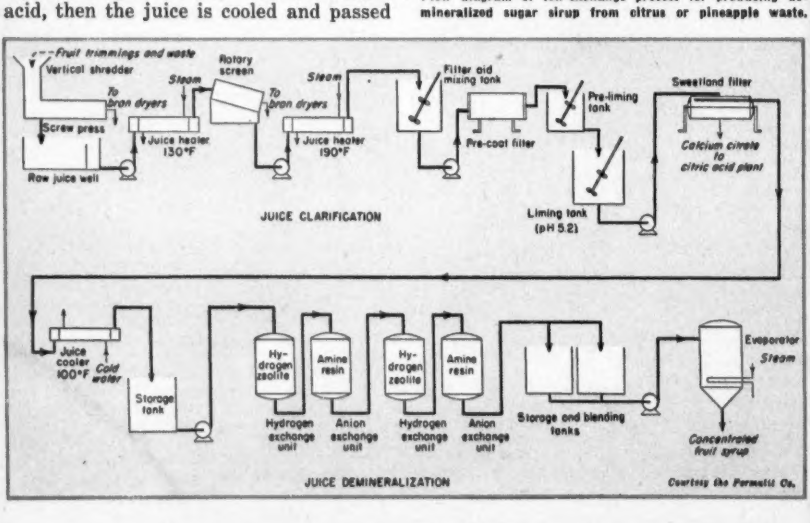
**Ion-exchange process successfully used to demineralize juice pressed from citrus peels and outer pineapple shells. Application to cane and beet sugar studied**

Natural sugar is recovered from non-potable fruit juice by a highly successful adaptation of the ion-exchange process used in water-softening and demineralization systems.

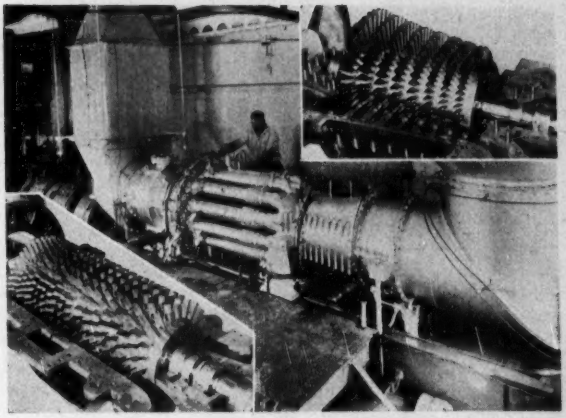
With this system, Hawaiian Pineapple Co. will obtain 4,000 tons of sugar sirup annually by processing daily 300,000 gal. of juice from the outer shells of pineapples, and it also will increase citric acid recovery. Citrus Concentrates, Inc., will process 25,000 gal. of citrus-peel press-juice a day. Samples of the product are of excellent flavor and have remained light colored in storage tests. The juice will be used as a table sirup, as well as a sweetener for such products as canned grapefruit. Similar methods (see diagram) are used for processing pineapple and citrus wastes, but the latter involves an additional operation to remove the bitter glucoside. Lime precipitation and filtration remove citric acid, then the juice is cooled and passed through cation and anion exchange beds for virtually complete demineralization. Being neutral, the treated juice then is ready for concentration in an evaporator.

Containing a hydrogen zeolite, the cation exchange unit removes metal and other cationic constituents by exchanging hydrogen ions to form the corresponding acids. The anion exchanger utilizes an amine resin to remove the acids, which are recovered. Citric and malic acids can be obtained, depending upon how the anion exchanger is regenerated. Non-electrolytes pass through the process, so it is possible to remove the electrolytes from any sugar solution to improve taste and odor.

The exchange materials can be regenerated and used indefinitely in a carefully operated plant. In the Citrus Con-




**Flow diagram of ion-exchange process for producing demineralized sugar sirup from citrus or pineapple waste.**



COMPACT POWER—This Westinghouse experimental, 2,000-hp., 18 ft.-long, gas turbine-generator weights only 19 lb. per hp., occupies but ¼ cu. ft. per hp., starts in 90 sec. It is an in-line unit with elements on pivots to permit axial expansion of several inches. Components (right to left): exhaust diffuser, turbine, combustors, compressor, reduction gear, generator. Compressor blades (left insert) are forged from 12% Cr. steel and caulked into serrated grooves in forged carbon-steel rotor. Combustor cells have chrome-nickel flame tubes. Turbine blades (right insert) are precision-cast cobalt-chromium-tungsten alloy, tapered and twisted, set in 24-in. forged 19-9 stainless rotor of 14 in. dia.—AMERICAN MACHINIST

centrates installation, cation beds are regenerated with sulphuric acid, the anion beds with sodium carbonate solution.

Special resins are employed in the Hawaiian Pineapple plant to avoid difficulty with the aldehyde constituents of the juice.

The ion-exchange system is under investigation for the treatment of cane and beet sugar, where the molasses-forming sodium and potassium cations and the scale-forming ions are removed, along with other impurities. —FOOD INDUSTRIES

## COAL CHEMICALS PROGRESS; FACE OIL COMPETITION

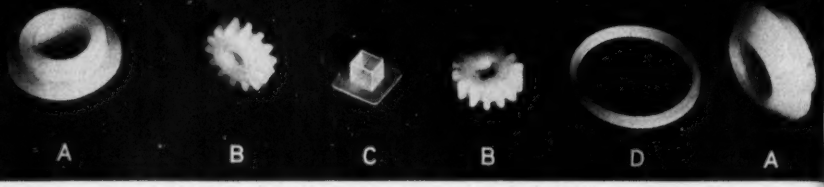
In the coke oven industry, Cottrell electrostatic precipitators are steadily replacing the old tar extractors, continuous centrifuges are used for drying the sulphate in many plants, advantage is taken of stainless steel and other alloys to resist corrosion, and new developments in still design are embodied in fractionating columns. A new and improved type of saturator employs a packed column for contacting gas and mother liquor. Provision is made for crystal-size control.

Markets for many of the coal tar chemicals, however, are threatened by petroleum refiners' products, including toluene and ortho-xylene (for manufacture of phthalic anhydride). Naphthalene and benzene also can be produced in large volume whenever price and market demands justify it. —CHEMICAL ENGRG.

## NEW BRIDGE IN 3 HR. 54 MIN.

Because 56 trains per day passed over Reading Co.'s New York Short Line, speed was essential in replacing an inadequate 75-ton bridge with a new 150-ton span. The new 65-ft., double-track, through-plate-girder structure was erected on falsework along one side of the old bridge, and falsework also was placed along the other side. Then the old span was jacked up for placing of skid rails under the bearings and to raise track to new bridge elevation.

With blocks and tackle, the old bridge was skidded 32 ft. onto the prepared falsework. Two hand-crabs operated by compressed-air wrenches furnished the pulling power. After shifting the hauling lines, the new span was skidded into place on the abutments, jacked up to remove skids and to set bearing plates and anchor bolts, then lowered into permanent position. The exchange of bridges was completed in the short time of 3 hr. 54 min. —CONSTRUCTION METHODS




These are made of nylon: (A) compression valve seat in household plumbing devices. (B) Spur gear in aircraft navigational instrument. (C) Coil form in miniature transformer. (D) Nylon washer in bubble chamber aerial sextant; it replaced lead washer. Interesting potential use is in bearings which cannot be lubricated.

# Nylon—Tough Industrial Plasti

**Good moldability and machinability make high-strength, chemical resistant plastic a useful material for industrial designer**

Possessing unusual bearing strength, heat resistance, toughness, and chemical resistance, nylon is a useful industrial plastic. Coupled with good moldability and machinability, these properties are putting it into such products as bearings, gears, valve seats, and electrical parts.

Nylon is not a specific product, but is a family of chemically related high molecular weight "super polymers" known as polyamides. These are used in many forms, such as fibers, filaments, coatings, solutions, and as molding powders in the manufacture of solid objects.

Although technically classed as thermoplastics, in that they can be injection-molded and can be ground and remolded, nylon molding powders behave in many respects like a metal. They have relatively sharp melting points at about 505°F. for the FM-1 type and 450°F. for FM-3. The former is extremely fluid for a plastic when melted, having an apparent viscosity approximately that of light lubricating oil. FM-3, only recently available, is a slightly softer, lower melting form of nylon, and is used where better moisture absorption is desired.

While most thermoplastics have service temperatures limited to about 160°F., nylon, especially FM-1, does not soften until well above 300°F.

Besides having low water absorption, nylon is inert to virtually all organic acids, carbon bisulphide, halogenated hydrocarbons, carbon tetrachloride, trichlorethylene, sodium hydroxide, soaps, gasoline, benzine, aldehydes, petones, and alcohols. The exceptions are formic and carbolic acids, these being solvents for molded nylon.

Properties of molded nylon are:

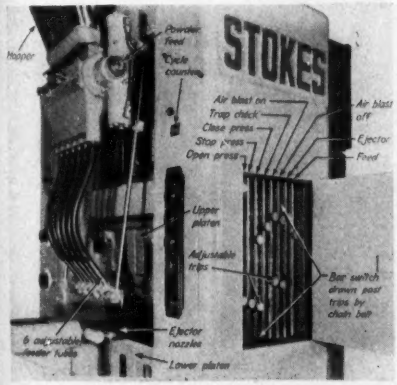
| | FM-1 | FM-3 |
|---|---|---|
| Specific gravity | 1.14 | 1.09 |
| Tensile strength, psi. (77°F.) | 10,530 | 7,600 |
| Flexural strength, psi. (77°F.) | 13,000 | 8,200 |
| Impact, Izod, ft.-lb./in. (77°F.) | 0.94 | 1.34 |
| Rockwell hardness | M90 | M54 |
| Coefficient of expansion /°F. lin. | $5.7 \times 10^{-5}$ | $8.2 \times 10^{-5}$ |
| Dielectric strength—short time-volt/mil | 385 (0.125 in.) | 470 (0.125 in.) |
| Dielectric constant—$10^3$ cycles | 4.0 | 4.5 |
| Power factor—$10^3$ cycles | 0.02 | 0.042 |

In molding nylon, precise temperature control is necessary, and moisture content of nylon flakes must be held to close limits. Many nylon products, however, are made by machining standard molded shapes (rods are available in ¼- to 2-in. dia., as well as some strip and slab sizes). In machining nylon the highest possible speeds should be used, and tools kept sharp. High-speed steel or tungsten carbide tools give good results, these being ground with a large clearance angle. High-speed drills are best, operated at highest rpm. possible without "gumming" the stock. Washers,

disks, and other small shapes can be machined from nylon stock in an automatic or hand-type screw machine, with high cutting speeds and feeds. For cutting screw threads on nylon rods, self-opening dies with high-speed chasers are advocated. —PRODUCT ENGRG.

## GLYCERIN FROM GAS

Shell Chemical Co. plans to produce glycerin in 1948 by reacting propylene gas, a petroleum byproduct, and chlorine to produce allyl chloride. Treatment of the allyl chloride with caustic soda will produce allyl alcohol, which will be converted into glycerin. The process was developed in pilot-plant operation before the war, but no commercial use was made of it. Cost of process is prohibitive unless propylene already is being produced for other purposes. —BUSINESS WEEK




**SELF-OPERATING PRESS—Automatic regulation of the entire cycle of this plastic molding press is effected by a bar-type controller (lower right). There is a bar for each part of the cycle—feeding, closing, heating, curing, opening, ejecting, and mold cleaning. On each bar is a button, whose position is adjustable. A chain drive carries a bar trip past these buttons, contact with a particular button initiating a particular part of the cycle. Six feeder tubes individually adjustable for position and capacity (⅛ to 3 cu. in.) load the mold cavities. Ram pressures of 7 to 50 tons per sq. in. are attained. Thermostats control temperature of upper and lower electrically heated platens in this new F. J. Stokes Machine Co. press. Ejection is mechanical-pneumatic. Each part is weighed automatically and press stops if it is not right. —PRODUCT ENGRG.**

## LITTLE CONSTRUCTION TOOLS MAKE BIG TIME SAVINGS

For oiling steel road forms, a portable pressure sprayer is a big improvement over the old bucket and brush that were wasteful of time and material . . . Pneumatic impact wrenches save labor time in tightening or loosening bolts, especially in steel erection . . . Punching holes in steel members no longer is a tedious task, thanks to a portable punch powered by blank cartridges which are exploded by tapping a firing pin . . . Laborious driving of wood sheetpiling is eliminated by a small air-powered driver fitted with steps so operator can ride it down as it sinks sheeting . . . A hot flame applied by a long gas torch speeds removal of rust and scale from steelwork preparatory to painting . . . A new automatic welding gun attaches hanger and fastener studs to steelwork, in fraction of a second, to hold siding, roofing, or insulation in place. —CONSTRUCTION METHODS

## FAN CLEANS CEILING

A 20-in. propeller-type fan, mounted on an overhead monorail, cleans the card room ceiling effectively at Erwin Cotton Mill. It eliminates blowing down and hand cleaning, and does not stop card operation. In room containing 222 cards, 2,300 ft. of monorail is used, the rails being spaced about 13 ft. apart and in line with card cylinder shafts. Fan is set to blow at 45-deg. angle to ceiling. Cleaner is operated about 30 min. per week; previous cleaning costs were $50 per week. —TEXTILE WORLD

## HIGHWAY POST OFFICE

A post office bus, recently adopted by U. S. Post Office Dept., will bring mail service to isolated areas not previously serviced and to areas where train service has been discontinued. Two hundred routes are planned. Average one-way route will be 150 miles, no routes will traverse snow belt or mountains. Mail will be sorted enroute.—BUS TRANSPORTATION

## NYLON STAPLE FIBER TO BECOME AVAILABLE

Produced experimentally by du Pont and expected to be in commercial production in 1947, nylon staple fiber is reported to have outstanding properties of strength, abrasion resistance, and dimensional stability. The material has been processed by itself and blended with other fibers such as wool yarn, worsted yarn, and cotton yarn. Acetate dyes and acid colors can be used on nylon fabrics to give a wide variety of colors.—CHEMICAL ENGRG.

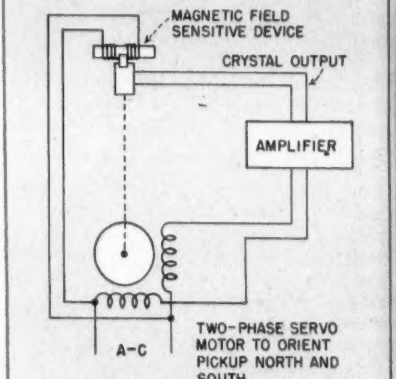
## BETTER PORCELAIN ENAMEL

In an effort to reclaim markets lost to stainless steel, synthetic porcelain, and plastics, Porcelain Enamel Institute is concentrating on better steel sheets to which single-dip coats will stick, and on improved frit, a coating mixture of silica, alumina, and alkalies. An improved steel sheet has been produced by using tetanium or cerium as alloying material. Manufacturers say an improved single-dip frit will be forthcoming.

Spraying has been found preferable to older dipping process, and the application of thin coats by electrostatic spraying is under consideration. Continuous baking furnaces will cut production time. New outlets for products are being sought; tests on interior and exterior house walls of porcelain filled with lightweight cement have been made. —BUSINESS WEEK

## ADVANCED MACHINE DESIGN

Nonmetallic ways are used for the table and column base in the new planer-type horizontal boring, drilling, and milling machine of G. A. Gray Co. The machine also has electronic drive for all feeds and automatic power clamping of the table, column, headstock, and end supports. Simplified controls for head, column, spindle, and table are centralized in pendant switch, which can be placed in any convenient position. A micro-jog button positions various units within an accuracy of 0.00025 in.—AMERICAN MACHINIST




**ELECTRONIC POSITION PICKUP**—Industrial or aircraft instruments can be read at a distance with a new electronic pointer position pickup devised by Fairchild Camera & Instrument Corp. The pickup is a modified earth-inductor compass, comprising a piezoelectric crystal and an armature energized by ac. It provides an output voltage that shifts linearly in phase as a function of an instrument pointer on which a small permanent magnet is mounted. When connected to an amplifier and servo, the pickup will keep itself oriented with the field of the pointer magnet. —ELECTRONICS

## SAVING THROUGH SALVAGE

New salvage program of Thompson Products, Inc., netted a $1,500 savings in tools, machine parts, and other items the first month of operation. No material, other than production scrap, can be placed in scrap bin without foreman's approval. Scrap is collected by transportation section, rather than salvage section, to eliminate padding of salvage report. Program also stipulates:

1. Salvage department separates genuine scrap from salvageable items.
2. All salvageable items become property of salvage department.
3. Items are returned to primary production department or sold to other departments. Scrap is sold on open market.
4. Profits of salvage are prorated to all departments.

Repair of tools or parts is done in salvage department. —FACTORY

## OXYGEN BLAST TO SPEED STEEL PRODUCTION

In a move to speed iron and steel making operations, oxygen will be used on a test basis in blast and openhearth furnaces at Bethlehem Steel. To supply the oxygen —and to determine how cheaply it can be made in tremendous quantities—Air Reduction Co. is building a 3,600,000-cu.-ft.-a-day pilot plant. Oxygen will be extracted from the atmosphere in conventional way—compressing, cooling, liquefying, and distilling to remove nitrogen and other unwanted gases. Oxygen may increase output 25-30%.—BUSINESS WEEK

Soviet engineers also are developing process for using oxygen instead of air in blast furnace smelting. This follows invention of a low-cost means of producing oxygen, details of which have not been announced. It is believed in Russia that the oxygen-blast method eventually can lead to a continuous steel-making process, eliminating converters and ingot-soaking pits. —PRODUCT ENGRG.

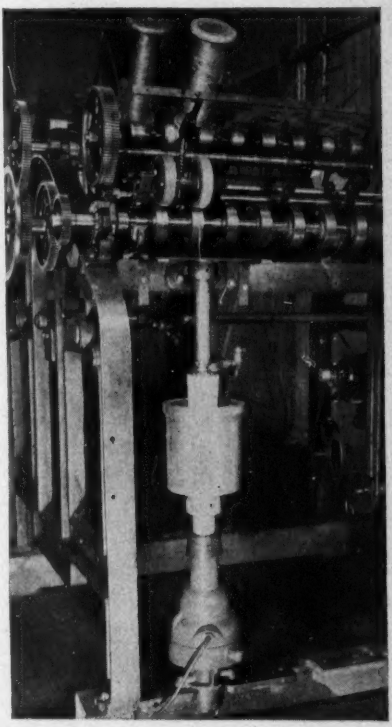
## ELECTRIC BOILERS USE EXCESS HYDRO POWER

To utilize all available water for generation at Swiss hydroelectric plants, excess power is supplied to electrically heated steam accumulators. In one installation, the accumulators also can be coal-fired when excess electric power is not available, reducing size requirements. These operate on 380 volts. In another installation, a 12,000-volt water heater, insulated from the earth, operates in parallel with two fuel-fired units. The heaters are equipped with automatic control and safety devices. —POWER

## TELEVISION BY LIGHT BEAM

Using a special cathode-ray tube in place of usual transmitter antenna, pictures have been televised 35 in. by the new Photovision technique. Picture signals sent to tube by camera and amplifiers vary intensity of beam. Receiving station antenna is a highly sensitive phototube. Thereafter, normal television equipment is used.

Tests are planned to send signals over 5-mile gap. General broadcasting by light beam is not contemplated, but system might be used between main transmitter and theaters or between scene of action and transmitter. —BUSINESS WEEK



**NEW SPINNING PROCESS**—Producing commercially spun worsted yard packages weighing 3 lb., about 700% larger than usual, the new J. J. McCann aluminum pot-spinning process uses a main chamber of 7-in. dia. and 7-in. depth. Worsted strand from front roll is fed into the motor-driven pot. Below main chamber, a 3-in. dia., 1-in. deep chamber, with fan at bottom, pulls leading end of fiber down, keeping it out of package proper. Able to handle fibers other than wool, spinning device can be used as twister or roving frame. Set-up and maintenance are simple; no rings or travelers are used. Drafts up to 25 are possible. —TEXTILE WORLD

# NEW PRODUCTS

**Fast Cutters for Cast Iron**—A cast iron roll that requires 25 hr. for rough grinding was turned in 8½ hr. with two 8-in.-wide tools developed by Kennametal, Inc. Made in 4, 6, and 10-in. widths, blades have four cutting edges that may be used in succesion before resharpening. —AMERICAN MACHINIST

**Detects Carbon Monoxide**—New gel, capable of detecting one part of CO in 500,000,000 parts of air, has been developed by U. S. Bureau of Standards. The yellow gel turns greenish blue in presence of CO; the CO content is checked for amount against a set of colored chips. —BUSINESS WEEK

**Super-fast Counter**—Small objects like pills —or 12,000 radiation particles per min.— can be counted with the versatile multiple electronic counter of Potter Instrument Co. A simple contactor or photoelectric pickup triggers device, which actuates relay to operate controllers. —CHEMICAL ENGRG.

**Fast, One-man Track Drill**—Capable of drilling 1½-in. holes through standard 90-lb. railroad rail in 30 sec., the new power drill of Buda Co. is operated and moved along track by one man. A 1½-hp. air-cooled gasoline engine drives a spindle chuck that takes ¾- to 1½-in. bits. Hand crank controls feed. Over-rail hook is released with single upward movement. —PRODUCT ENGRG.

**Descales Cooling System** — Spring-and-core unit fitted into top of hose connection or in top of radiator removes old scale from automobile cooling system and prevents further formation of scale by electrolytic action of galvanic cell and mineral content of water. Spring is silver-plated, core is a patented metal. Unit, guaranteed for 1 year or 25,000 miles, was developed by Butler Engineering Co. —BUS TRANSPORTATION

**Jet Pump**—Water under pressure is used to produce pumping action through a high-velocity jet in a small, portable pump developed by Derbyshire Machine & Tool Co. The pump has no moving parts, will handle fluids containing dirt, can be used with centrifugal pumps. —FACTORY

**Six-sided Textile Roll** — Hexagon-shaped, stainless steel rolls which have more pulling power on fabrics than round rolls, and produce continual shaking which aids in drying, have been developed by Rodney Hunt Machine Co. for conveyors carrying fabrics into dye kettles. —PRODUCT ENGRG.

**Supersensitive Surface Analyzer**—Surfaces are explored with a fine diamond point and accuracy of finish checked as closely as one millionth of an inch with Brush Development Co.'s new electronic analyzer. "Peak and valley" profile of surface is recorded on a chart. Instrument consists of a pickup arm, drive head, amplifier, magnetic direct-inking oscillograph, surface plate, and calibration standard. —PRODUCT ENGRG.

**Earth-boring Machine**—Holes up to 24-in. dia. can be bored to depths of 8-9 ft. by Tips Engine Works' hydraulically controlled machine. Finger-tip control gives automatic regulation of cutting speed to suit soil. Hydraulic feed maintains constant pressure on bit, keeping max. rpm. on auger without clutch or gear slipping. Pressure on bit lessens shock to machine working hard-to-drill soil. —ENGRG. NEWS-RECORD

**Phototube Tachometer**—Light shines upon a phototube through openings in a rotating disk to actuate the new electronic tachometer of General Electric Co. The pickup head is connected by cable to a portable instrument reading directly in rpm. Range is 300 to 50,000 rpm. —ELECTRICAL CONTRACTING

**Hearing-aid Radio**—In addition to the loudspeaker and its control, a new table-model broadcast receiver of Emerson Radio & Phonograph Corp. is equipped with an output for a hearing aid on a separate volume control. —ELECTRONICS

**SIMPLIFIED SOCKET—Made by assembling the required number of contacts in square holes pierced in a chassis of insulating material, this socket requires no separate socket assembly. Beryllium copper contacts are for subminiature electronic tubes having coplaner leads with 0.053-in. or more spacing. U-shape lower end of self-aligning contact wedges into square hole to withstand withdrawl force of 2-5 lb. It is an Instrument Specialties Co. development. —PRODUCT ENGRG.**

**Fluid Motor**—Self-starting, "floating drive" motor of axial-piston design gives instant speed-up control for rapid traverse through constant-pressure control between driving and driven members. No mechanical linkage or connection is used in the self-lubricating motor. Available in 3- or 5-hp. sizes, the motor comes with or without speed-control valve; geared-head units are available. Motor was developed by Davison Engineering Co. —FACTORY

**Tiny Heater for Home**—Measuring 14x30x9½ in., Stewart-Warner Corp.'s new gas-fired, stainless-steel furnace will heat a 2½-room home. It provides protection against fire or asphyxiation, can be placed between walls or under floor. —BUSINESS WEEK

**Compressed-air Cleaner** — Compressed air passing through the Aridifier drives four rotors at high speed. Moisture, oil, and dirt in the air are impinged on the rotors, thrown to the housing wall by centrifugal force, and caught in a trap which is emptied periodically. Logan Engineering Co. developed the device. —ENGRG. & MINING JOURNAL

**Lead Saver**—Reducing lead breakage, rubber sleeve inside chuck of new Elastichuck Sales Co. aluminum drafting pencil is only contact between lead and pencil. Chuck is knurled, hardened steel; barrel is knurled for normal grip. —BUSINESS WEEK

**Trigger Releases Vise**—A heavy-duty bench vise which can be closed by a push and opened by a trigger has been developed by Grand Specialties Co. —AMERICAN MACHINIST

**Faster, Safer Cable Tap**—To save time and avoid the hazard of tapping self-supporting aerial cable at transformer points, Burndy Engineering Co. has developed a new pre-tap. It consists of a T-connecter installed at predetermined points, when line is erected, and a member which holds end of tap conductor and screws into T. Parts are insulated, eliminating crotch taping. —ELECTRICAL WORLD

**Auto-performance Meter**—Developed to check braking action and acceleration of motor vehicles, Metron Instrument Co.'s Performeter operates on pendulum principle, set-back being transmitted to indicator.—BUSINESS WEEK

**Simple Liquid Separator**—Designed to break emulsions on steam distillation streams and remove water from gasoline and other organic liquids, a new phase separator for immiscible liquids consists essentially of only two parts. It has a chamber containing a coalescing medium through which the liquid mixture passes first. The other part is a separating chamber where remaining aqueous phase is completely separated by passage through preferentially wetted membranes impervious to that phase. Selas Corp. of America developed it. —FOOD INDUSTRIES

**BIG CLAMSHELL ON WHEELS—This clamshell-bucket, bottom-dump wagon has a capacity of 16.2 cu. yd. struck measure and 20 cu. yd. with heaped load. Buckets open to 6x10-ft. area, and wheels are outside the dump spread. Dumping is controlled by a ½-in. cable on a drum powered from the truck transmission. Dixon Wagon, Inc., developed it. —ENGRG. & MINING JOURNAL**

**Makes "Gas" from Oil**—To provide a fuel which can be piped, burned, and controlled in the same way as gas, Vapofier Corp. has developed a small unit which converts fuel oil to vapor and mixes the vapor with air. Flame quality may be varied from oxidizing to reducing. Oil is kept at constant level in a combustion chamber, and products of combustion are drawn through the surface of the fuel to vaporize it. Capacities are 70,000 to 2,000,000 Btu. per hr. —FOOD INDUSTRIES

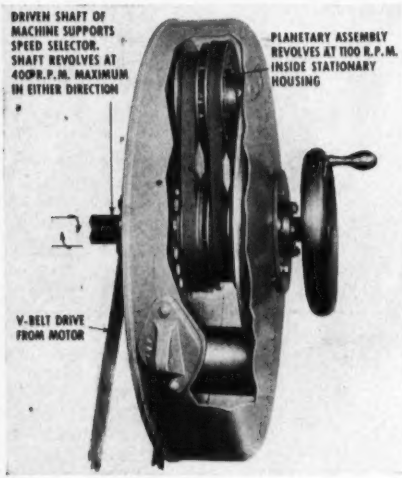
**Quick Fault Finder**—Accidental grounds in overhead electric power lines are located by a low-frequency radio receiver developed by Raytron, Inc. It permits following rural primary lines by automobile at a distance of 100 yd. or more. The faulted circuit is fed through a capacitor to limit current and to produce harmonic currents to which detector is tuned. —ELECTRONICS

**Fast-setting Wood Glue**—Cold-run, fast-setting wood glue developed by National Adhesives can be handled or machined after 20-30 min. clamping time. Strong, resilient bond is unaffected by humidity changes; various colors available.—ENGRG. NEWS-RECORD

**Spray-on Rubber Adhesive** — Applied by spray-gun, a new rubber-base adhesive saves time in sealing corrugated cartons. U. S. Rubber Co. introduced it.—CHEMICAL ENGRG.

**Oil Burner New 3 Ways**—An industrial oil burner developed by American Heating Corp. has a rarefaction chamber in which fuel is transformed to gas by head-on collision with air or steam. Having no blowers, this Arc-Heat burner relies entirely upon induced air in firebox. A manually set modulating valve can restrict oil and air flow and amount of heat generated. —POWER

# NEW PRODUCTS


DRIVEN SHAFT OF MACHINE SUPPORTS SPEED SELECTOR. SHAFT REVOLVES AT 400 R.P.M. MAXIMUM IN EITHER DIRECTION
PLANETARY ASSEMBLY REVOLVES AT 1100 R.P.M. INSIDE STATIONARY HOUSING
V-BELT DRIVE FROM MOTOR

**ANY SPEED EITHER WAY**—Infinite-ratio, stepless, speed variation in forward or reverse directions is achieved by planetary motion in the new constant-torque, 0 to 400-rpm., industrial drive unit of Speed Selector, Inc. The device compares the ratios of two V-belt drives and applies the difference in speed to the output shaft. Handwheel alters pitch diameter of center pulleys, so that one is increased, other decreased, change being imparted to outer pulleys by wedging action of belts. —PRODUCT ENGRG.

**Dual-drive, 12-speed Lathe**—Eight low (28 to 445 rpm.) and four high spindle speeds (540 to 1,800 rpm.) are provided by the dual gear and direct belt drive of R. K. LeBlond Machine Tool Co.'s new lathe. Low-speed drive is from main V-belt through gear train to spindle; high-speed drive cuts out gear train, runs from high-speed shaft to spindle through second V-belt drive. —AMERICAN MACHINIST

**New Textile Chalk**—Made by Uxbridge Worsted Co., a new textile marking chalk, available in nine colors, may be washed from cloth by warm or cold water or by scours, and will not set in contact with water, steam or chemicals. —BUSINESS WEEK

**Handy Paint Remover**—Because it stays moist 24 hr. even in sun, Bull Dog Remover cuts deeply. Gillespie Varnish Co. claims that it is free of acid or alkali reactions, does not raise or damage wood grain, has no disagreeable odor. —POWER

**Foolproof Counter**—Electrically coupled to a production machine's current supply, the electronic counter developed by Lansing Engineering Co. indicates the number of operations. The machine operator cannot fake the work cycle. When motor load current increases during productive work, a bridge circuit causes the potential of a trigger tube to actuate a holding circuit and close a switch that operates the counter.—PRODUCT ENGRG.

**Electronic Ignition**—Using a condenser as an accumulator, an electronic airplane ignition system, devised by Bosch, Germany, eliminates magneto deficiencies. Condenser is charged through a resistance, discharged through grid-controlled vacuum tube to primary of high tension coil at spark plug. Condenser charge builds up after discharge because grid voltage prevents passage of current between anode and cathode. —BUSINESS WEEK

**Automotive Circuit Breakers**—Made by Spencer Thermostat Co., new circuit breakers for autos interrupt short circuits and overloads and eliminate replacment of fuses. They are available in manual or automatic reset types. —BUS TRANSPORTATION

**Airplane Radio Weighs 1½ Lb.**—Suitable for small aircraft, Bendix Radio Div.'s Type PAR-3 receiver weighs only 1½ lb. and can be easily installed for traffic control, cross-country radio-range navigation, or weather-report reception. Tuning range is 195-410 kc.; circuits is 4-tube superheterodyne using intermediate frequency of 455 kc.; selectivity is 25 kc.; max. audio output is 125 mw., using 67½-volt B battery. —AVIATION NEWS

**Keeps Kitchen Clean**—A new ventilator, inserted in any standard gas range, traps volatilized grease, odors, and vapors, and passes them outside through air ducts in floor. Simple to install, it has built-in filters, power unit, and blower. It is made by V. E. Sprouse Co., Inc. —ELECTRICAL MERCHANDISING

**Little Automatic Welder**—Controlled by a single pushbutton, a new DoAll Co. high-production butt welder handles bar and round stock up to 5/16-in. dia. Automatic motor feed is said to assure good work with inexperienced operators. Lever-operated cams clamp work. A built-in grinding wheel dresses welds. —PRODUCT ENGRG.

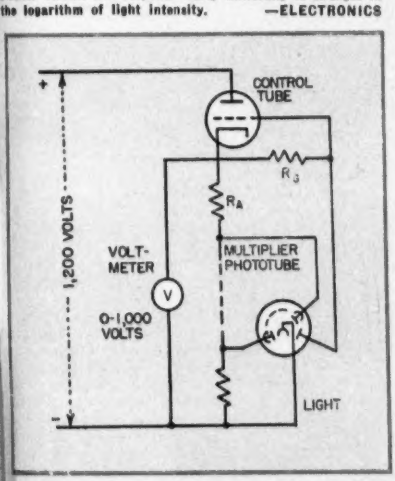
**Light Marine Engine**—Of aluminum-alloy construction, except for block and head, a new horizontal-design, 6-cyl. gasoline marine engine develops 225-hp. but weighs only 965-lb., one-third less than conventional motors of same capacity. Vibration is eliminated by full counterbalancing. Higher compression ratios are gained without increased burning loads through patented combustion chamber. Cylinder sleeves can be removed easily by hand. —BUSINESS WEEK

**Lengthens Bearing Life**—Maximum load per roller is reduced about 25% through the better load distribution attained with saddled mounting for journal boxes developed by SKF Industries. This increases bearing life 33%. In conventional mounting, elastic deformation of box tends to overload the few top rollers. Saddle design avoids stress concentration by applying load at sides. —PRODUCT ENGRG.

**Casein Bristles**—Synthetic bristles, developed by U. S. Dept. of Agriculture, are made by extruding a casein and water mixture through dies. They are resistant to oils and organic solvents. Other protein materials from agricultural products are being studied as possible substitutes. —BUSINESS WEEK

**Plastic Clothes Line**—Coated with vinyl plastic, new Agate Plastic Corp. clothes line won't kink, stretch, slip, crack, or wear, is easy to tie. Coating is not affected by rot or bacteria. —ELECTRICAL MERCHANDISING

**LOGARITHMIC PHOTOMETER—Since density of photographic films is the logarithm of the reciprocal of transmissivity, a logarithmic phototube amplifier system gives a uniform density scale. Such a scale also is desirable in chemical analysis where the concentration of a solution is to be studied as a function of optical transmission. Shown here is the basic feedback circuit for producing a logarithmic relation between light intensity and dynode voltage of a multiplier phototube. As the light intensity increases, phototube anode current tends to increase. But the grid of the control tube is driven to a more negative potential, the bleeder current is reduced, the dynode voltage is decreased in proportion, and the sensitivity of the tube as a whole decreases. A voltmeter connected across the total bleeder circuit will respond nearly uniformly to changes in the logarithm of light intensity. —ELECTRONICS**




**Hydraulic Fuses**—Protection in event of rupture in a hydraulic line is provided by two new "fuses" of Simmonds Products, Inc. One shuts off after a predetermined quantity of fluid has passed through it and protects individual actuating cylinders. The other is a return-flow fuse which protects an entire hydraulic system. It shuts off if a line break drops the pressure. —PRODUCT ENGRG.

**Makes Flame Cut Straight**—A magnetic straightedge guide for flame cutting steel plates and shapes with a hand torch has been introduced by Universal Power Corp. Made of specially heat-treated aluminum alloy, it does not warp, and it is light and corrosion resistant. —CONSTRUCTION METHODS

**Steerable Parachute**—A wedge-shaped vent, 4½ ft. long, in a standard parachute increases controllability and steerability. Vent is behind jumper, and control lines run to rear harness risers. Oscillation is reduced by escape of air; jumper faces away from wind. —AVIATION NEWS

**Screw Nails**—High-tensile square manganese-steel wire—twisted into a helix, headed, and heat treated—forms nails which may be driven tight. They were used for ordnance boxes during the war, now hold planking on skids. V-point avoids splitting wood. With cone point, the Hillwood Mfg. Co. nails will attach wood to steel sheet, steel to steel, or steel to concrete. —AMERICAN MACHINIST

**Stain-proofs Cloth**—Vinyl-butyral plastic, developed by Monsanto Chemical Co., can be used to stain-proof fabrics, without noticeably changing appearance or texture of cloth. Applied by any existing coating machine, bonding agent will not chip or peel. Fabrics will stand launderings and moderate-temperature ironing. —TEXTILE WORLD

**Calculates Heat Loss**—Amount of steam, hot-water, or warm-air radiation required for different types of building construction in a given area is determined quickly by moving a slide to proper window of a new Smithson Co. calculator. —POWER

**Sapphire Micrometer**—Lightweight, tubular micrometers with long-wearing sapphire spindle and anvil tips now are made by Tubular Micrometer Co. —AMERICAN MACHINIST

## FREE SERVICE TO READERS

*As a special service to our readers, McGraw-Hill Digest will furnish, without any charge, additional information about any new product or technical development described in the publication. Inquiries are welcomed. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y. U. S. A.* —THE EDITORS

# Industry Decentralizes

**Physical and managerial decentralization pays off in increased productio and better management-employee relations. War boosted movement in U. S**

Industry in the United States, large and small, producing both capital and consumer goods, is slowly decentralizing physically and managerially. Benefits accrue to management, employees, stockholders, customers, and the country. Decentralization takes one of two forms: the physical plant and structures or management methods and controls. More often it is a combination of the two. Greatest benefits seem to lie in the combination decentralization.

Causes of the movement are many, among them: company mergers, subcontracting, outgrowth of physical facilities, supplies, markets, new products, or increased production facilities.

Companies believe that the movement solves not only production and distribution problems but many of the social problems of industry. Personnel men find their problems greatly simplified in the smaller plants where the employee retains his identity as an individual rather than becoming a production robot. In many cases, scattered plants have surpassed the older, larger parent plants in cost and efficiency standards.

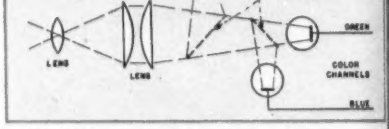
General Electric Co. is aiming at six objectives through its physical and managerial decentralization:

1. Avoid undue percentage of employment in community.
2. Employment in areas of company's customers and business.
3. Simplification and clarification of management authority and responsibility.
4. Acquisition, development, and dissemination of information on broad company policy.
5. Development of management ability through integration.
6. More intimate management-employee relations.

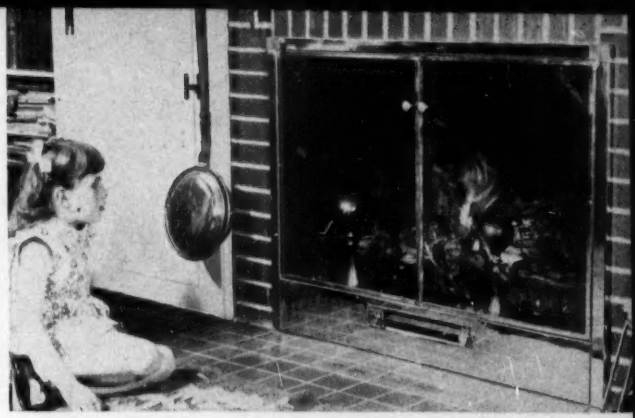
For 20 years, decentralization has been practiced in the textile industry. Stillwater Worsted Mills, Inc., began its decentralization program in 1924. Since that date Stillwater has built many new plants in small New England and Southern communities, bringing into the community only top executives. Little difficulty was encountered in converting farm hands to loom hands. Small plants built just prior to the 1929 depression weathered the slump.

During the war, decentralization received its greatest boost. The necessity of additional manpower, impossible to recruit in many industrial communities, pushed plants into the country. Sylvania Electric Products Co. proved that 20 small, separate plants could do the same in production as two old plants with eight "hodge-podge-annexes." Sylvania has been decentralizing its manufacturing for six years.

• Johnson & Johnson, Inc., purchased an




**COLOR FOR TELEVISION**—Beam-splitting camera arrangement for deriving three colored images from color-selective mirrors. The mosaics are keyed sequentially in the CBS system and operate simultaneously in the RCA system. While the former has been called "mechanical" because a rotating disk with three color filters has been used in the camera, either system can be operated electronically. The two systems give the same fidelity of color transmission, employ about the same bandwidth, are capable of about the same broadcast coverage. In the sequential system, the flicker problem is complicated because the light from one color field must disappear before the next color comes on. With the simultaneous system, color images may be received in black and white on a present-day television receiver, which would ease the transition from black-and-white to color. Transmission equipment needs of this system probably will be greater, at least initially, and it is difficult to produce an inexpensive direct-viewing receiver. —ELECTRONICS



**GLASS FIREPLACE SCREEN** — Preventing escape of room heat up chimney, this heat-resistant (650°F) glass fireplace screen also keeps smoke, sparks, and fumes out of room. Two adjustable doors at bottom concentrate draft on fire. Glass permits high degree of heat transmission. —SCIENCE ILLUSTRATED

entire town in Georgia—including 330 houses, three churches, a store, and a mill—to determine how an industry might be integrated into a community. Nineteen years of experience has shown Johnson management that the decentralization plan works. Production is up 36%, wage rates up 33%. Each separate plant is in business for itself. Management is now free of many of its housekeeping details and is free to concentrate on its true functions—production and employee relations. —FACTORY

## NEW WORLD STANDARDS ORGANIZATION FORMED

To provide a framework within which the engineers of all countries can work toward international standards, the new International Organization for Standardization has been established. It was created following the London conference of the standards associations of 25 countries, sponsored by the U. N. Standards Coordinating Committee. The IOS takes over the functions of the old International Standards Assn. and will carry on and expand its activities, backed by more sure financing. To be effective when ratified by 15 nations, the constitution of the association provides for a General Assembly, to meet every 3 years, in which each member nation will have one vote.

Practically the whole field of business and technology will come within the preview of the new organization. Already it is concerned with standards for essential oils, vegetable oils, ball bearings, unfired pressure vessels, and classification of electric motors. —PRODUCT ENGRG.

## CAUSEWAY OF PRECAST UNITS

Precast piles, floor slabs, and pile-cap shells were used for a 4,000-ft. California oil-loading wharf, simplifying construction, eliminating timber on the job, and saving labor. Of 18-in. section and 80-90-ft. length, the piles were cast 17 miles from erection area and transported to area by barge. Casting area was spanned by gantry using a six-point pickup for piles. Similar gantries were used to handle floor slabs and cap forms. Floor slabs, weighing 15 tons, were 20 ft. long and 7 in. thick at central panel. For 736 slabs cast, 96 forms were used. Cap forms—inside space 28x30 in.—had 3-in-thick walls and 2-in.-thick floor, reinforced with ⅜- to ½-in. steel bars. Forms for caps were only wood used.

After piles were driven, temporary steel channel girts were placed across 20-ft. bents for deck slabs. Cap forms were placed by derrick, filled with ready-mix concrete. Emulsified asphalt was used as admixture—1½ gal. per sack of cement—to improve moisture resistance. Reinforcing bars from piles tied down pile caps. Bars from pile caps tied down floor slabs. —ENGRG. NEWS-RECORD

**FOOD-O-MAT**—Shopping time is reduced one-third by the Food-O-Mat, a new packaged food dispenser for self-service grocery stores. Comprising a battery of 36x40-in. slanted shelves, at convenient height, the dispenser also saves 75% in floor space, 1,700 items being available in 75 lin. ft. Clerks periodically stock the partitioned shelves from behind, during store hours, three doing work of six or seven in a conventional store. Packages move to front of shelf by gravity and automatically fill gap when one is taken. Return slot for packages permits shopper to change her mind. —FOOD INDUSTRIES

## FLAME-CUTS STAINLESS STEEL

Stainless steel now may be flame-cut to close tolerances, at high speeds, with inexpensive equipment by using a fluxing agent to dispose of oxides formed by the cutting flame. Measured amount of fluxing agent, added to oxygen stream, converts oxides to low-melting-point slag, which flows away from cut. Flux feeder may be affixed to oxyacetyelene cutting torch at cost of $400. —BUSINESS WEEK

## MAGNESIUM BOOSTS PAYLOAD

Made of magnesium alloy, a tractor-drawn semi-trailer and trailer carry 6,000 lb. more payload than steel units of the same type. Operated by Permanente Cement Co., the equipment has high-strength magnesium alloy in the entire body, ladders, hatch covers, and dumping mechanism. Magnesium sheet and castings are used for doors, handles, hubs, gear spokes. —CHEMICAL ENGRG.

## FLASH WELDING FAVORED FOR STAINLESS STEEL

High speeds, closer tolerances, and little preparation of parts make flash welding a useful and inexpensive method of assembly for stainless steel parts. Automobile manufacturers, quick to utilize cost-cutting techniques, flash-weld components of bumpers, cowls, trim molding, and engine parts.

In flash welding, 5,000 to 10,000 amp. per sq. in. of welded area heats the pieces as they are butted together with an upsetting force of 25,000 to 50,000 psi. of cross-sectional weld area. One piece is clamped in a stationary platen, while the other is advanced toward it by a movable platen mounted on ways accurately aligned with the stationary one and insulated from it. The motion is controlled by cam or hydraulic action.

When parts first come together, rapid melting of minute contact points produces an "explosive" flash which cleanses weld area of impurities. As metal becomes plastic, velocity and force of movable platen drastically increase, flashing stops, upsetting begins, and current is cut off. The increased force forges the parts together. About 65% of platen travel occurs during flashing, remainder in upsetting.

Flash welds are more like parent metal in properties than welds made in any other way. —AMERICAN MACHINIST

## MINING OPPORTUNITY

Attention is being focused on the Siamese mining industry as an attractive field for future investment. All parts of that country have been thrown open for mineral exploitation.

There are numerous occurrences of tin, antimony, lead, zinc, copper, manganese, molybdenum, iron, gold, tungsten, coal, and gem-stones in the Kingdom of Siam. Only tin, however, has attracted appreciable foreign capital. During the war, tin smelting developed there, 18 plants being built. —ENGRG. & MINING JOURNAL

## BIG CARS, MOVABLE TRACK BOOST COAL OUTPUT

Daily raw coal output has been increased to 3,250 tons per day, or 540 tons per machine-shift, at Norco East No. 1 mine of Norton Coal Co. This has been accomplished by using 8-ton, drop-bottom cars, track-mounted loaders, and movable track. Operation uses 52 pieces of prefabricated rail, straight pieces being 16 ft. long, turns, 20½ ft. Turnout rails, except curved parts, are interchangeable.

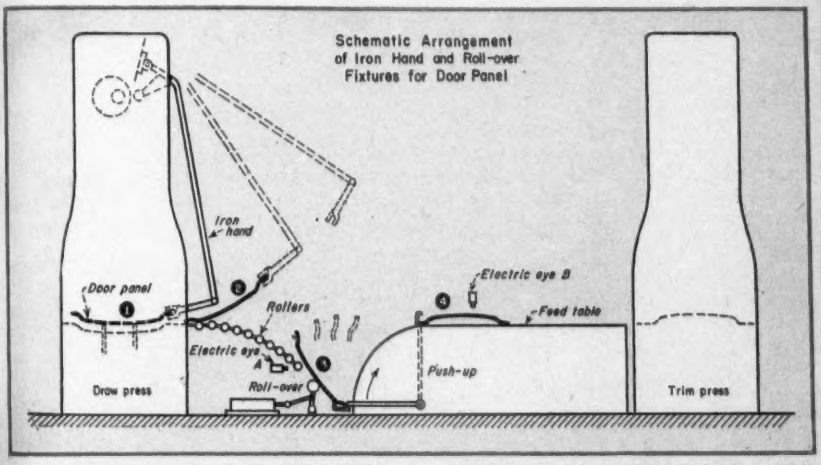
Double - rotary - clip steel ties hold the curved rails, single, curved, rotary clips hold straight or tangent track. Three trackmen can lay 16-18 sections, including switches, per shift. Prefabricated track necessitates cutting of places to fit track pattern.

In loading, five-heading system has been adopted over four-heading to keep loader in full operation; in normal operation, loader should fill 85-90 8-ton cars per shift. Cars dump into a 250-ton surge bin below seam at foot of slope. The coal is moved to tipple and warehouse by means of a 356-ft. 5-ply conveyor belt. —COAL AGE

## THREE-WAY CONTROL CARDS

Production control, quality control, and sales analysis are accomplished at Lenox, Inc., on two sets of cards, no subsidiary records being needed. Cards cover 3,500 different shapes and over 4,000 different patterns. Each order is punched onto two cards as received, and thereafter only inspection reports need be added. Through machine sorting, production control men can obtain information as to shapes, patterns, backlogs, and segments of backlogs. Such checking allows production schedules to be arranged quarterly.

Cards have allowed quality-control men to make the first accurate cost analysis at the plant. Quality-control reports are made every two weeks. —FACTORY




LABOR SAVERS—Manual handling is minimized in Fisher Body plant. Handling steps for door panel are: Position 1—Pressure pads or pins lift stamping off lower die as ram lifts, cam-actuated "iron hand" reaches in, and air-operated jaws close on scrap edge. Position 2—Iron hand pulls stamping onto roller table and jaws release. Position 3—Falling stamping intercepts beam to electric eye "A," roll-over pushes stamping onto face of feed table, and weight of stamping trips pushup-bar circuit. Position 4—Stamping is pushed onto feed table at convenient position for handling by trim-press operator if electric eye "B" "sees" no panel already on table. —AMERICAN MACHINIST

## CONVEYORS UP MULTI-STORY PLANT PRODUCTION 400%

Horizontal and vertical conveyor systems at the 5-story Randolph Laboratories, Inc., extinguisher factory have increased output 400%, at one-half the cost. They also have increased floor space for production operations 60%, improved quality, and bettered working conditions. Through elimination of most of the manual handling, workers formerly employed in materials handling have been released for productive jobs. Hook, U-type, and lift conveyors are employed. Wherever possible, both faces of U-type conveyors are used. —FACTORY

## NEW PROFIT-SHARING PLAN

To be effective, a profit-sharing plan must be kept separate from other incentive wage plans, retirement plans, and so on, so that the worker can watch and measure them independently. A new plan, recently put into operation, bases the fund received by the worker upon his average productivity, modified by his absenteeism, and further modified by a longevity factor. —AMERICAN MACHINIST

## TURNTABLE FOR SEAPLANES

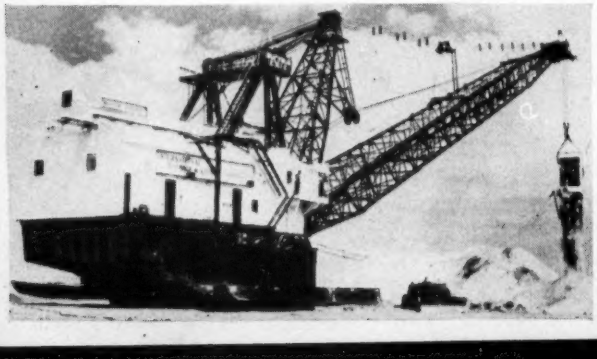
Developed to improve seaplane-base utility, a new beaching ramp consists of a turntable on an electrically operated cable car mounted on an inclined marine railway. One man operates it by push-buttons that control the cable car. For beaching, the car runs down track to water-level position, and off-center buoyancy tanks uptilt freeboard end and submerge opposite side of platform, permitting seaplane to approach for grounding. Ramp is then pulled to pier. For launching, turntable heads plane in other direction, is locked against tilting, and ramp is moved out into water until seaplane floats. Seaplane Ramp, Inc., built the device. —AVIATION

## WHY N. Y. PREFERS BUSES

New York City's Third Avenue Transit Corp. is shifting from street cars to buses as rapidly as possible. Seven hundred 44-passenger General Motors diesel buses eventually will provide service to millions of short-haul passengers. Important advantage in buses is their ability to stop at curb. Other advantages:

1. Speed up of service, as trolley cars are slowed by limits prescribed by tracks and traffic.
2. Presence of rails will no longer prevent city officials from adopting most efficient traffic handling plans.
3. Layout of new streets, bridges, and tunnels is simplified by elimination of rails.
4. Other traffic will be speeded up through elimination of track.
5. Flexibility in schedules will be possible through ability to turn back buses at any point along route.
6. Savings effected by elimination of rail maintenance costs.

The conversion will cost an estimated $11,000,000. —BUS TRANSPORTATION



**MINES PHOSPHATE FAST**—Huge walking dragline excavator employed in Florida phosphate operations excavates nearly 2,000 tons of overburden per hour. It can dig 30 ft. deep and carry its 64,200-lb. rock load 420 ft. to dumping spot, each cycle requiring only 1 min. It is powered by 46 electric motors totaling 2,100 hp., variable voltage dc. being used for its drag, hoist, and swing motions. It has extremely rapid acceleration and deceleration. —CHEMICAL ENGRG.

# What's New in Aircraft

**New cargo plane with 25,000-lb. payload; cockpits standardized; jet-propelled helicopter under test; in-wing engine measures 14x31x34 in.**

Now in ngineering stages, new Curtiss CW-32 4-engine cargo plane has 25,000-lb. payload and 1,500-mile range, gross weight being 80,000 lb. It cruises at 270 mph. at 25,000 ft., has pressurized cockpit, is designed for basic crew of two. There are three large cargo doors in sides and smaller door in nose for packages. Empennage which swings up for large loads, such as automobiles, is optional . . . New 2-place Sikorsky S-52 helicopter has all-metal rotor blades as standard equipment. These consist of extruded leading edges to which are riveted trailing-edge sections that can be replaced if damaged; leading edge can be treated same as propeller for repairing minor damage. . . . A standardized cockpit has been developed jointly by Army, Navy, and RAF. All control units will be in same position regardless of make of plane. Size and shape of controls are varied for quick and positive identification. Landing gear switch has a knob which looks like a tire; an arrestor hook switch is hook-shaped. —AVIATION

First personal plane designed in tandem in recent years, Aero-Flight Aircraft Corp.'s 85-hp. *The Streak* will cruise at 150 mph. Wings are designed for good stall characteristics and elimination of roll tendencies; drag-producing wingtip slots and cambered tip sections will be eliminated. Other characteristics: bubble-type canopy, flush riveted surfaces, retractable tricycle landing gear, fixed-pitch propeller, contact flight instruments. Plane can be flown from front or rear seat . . . Quantum Research Corp. is experimenting with jet-propelled helicopters to attain 200-mph.

Designed for installation in wing of light, pusher-type plane, the aircooled, horizontally opposed, 4-cycle "Fedden Flat" aircraft engine is only 14 in. high, 31 in. wide, 34 in. long. The 160-hp. engine has 2-piece aluminum crankcase, low-expansion, silicon-alloy cylinders, nickel-magnesium-chromium alloy high-expansion steel sleeves, direct-injection fuel system. Roy Fedden, Ltd., British firm, expects production in 1947 . . . Dutch aircraft engineers are developing a jet-powered airliner for trans-Atlantic runs. Two Rolls-Royce Nene engines, built into underside of fuselage, will power the 17-passenger craft . . . Glenn L. Martin's XP4M-1, 4-engine Navy patrol bomber, will feature a Pratt-Whitney R-4360-4 reciprocating engine and a General Electric I-40 jet in each of two nacelles. Top speed is 398 mph., service ceiling, 16,400 ft., gross weight 81,887 lb. —AVIATION NEWS

**FRENCH HELICOPTER**—Exhaust from a 170-hp. engine drives three-blade rotor of this SO 1100, French helicopter, at 300 rpm.; rotor blades are nozzle tipped. Same engine powers three-bladed, fixed-pitch, pusher propeller mounted behind cabin in guard-ring. The helicopter was exhibited recently at Paris air show but has not been flown. —AVIATION NEWS

## NEW TELEVISION TECHNIQUE REDUCES RECEIVER COST

Use of a common i-f amplifier for sight and sound signals, an important new development in television receiver practice, reduces costs and eliminates local oscillator tuning and drift difficulties. Constructed along fairly conventional lines, the receiver has an i-f channel broad enough to pass both picture and sound carriers, plus sidebands, and it makes use of the frequency difference between the two carriers.

That the wave applied to the second detector may be dominated by the picture i-f carrier, so that it successfully can demodulate the sound i-f carrier, it generally will be necessary to provide attenuation for the sound i-f by absorption trap circuits coupled to the i-f coils. Then the sound carrier will appear to the picture carrier as another sideband, so that in the second detector output there will be found, in addition to the video frequencies, a 4.5-mc. signal frequency-modulated with the sound. The whole output of the second detector then may be amplified by the visual video amplifier. Thus, the video and sound channels still are common.

Separation of sound and picture may be made at the conductor leading from the video amplifier to the picture tube, as shown in the diagram. The transformer primary circuit 2 is tuned to the difference frequency of 4.5 mc., preventing that frequency from appearing as picture modulation on the cathode-ray tube screen and providing a circulating current of considerable strength in the primary. This current is sufficient to induce a 4.5-mc. wave in secondary 5, which is tuned to 4.5 mc. The secondary is connected to tube 6 which serves as a limiter-amplifier to feed discriminator transformer 7 and balance detector tubes 8 and 9. These tubes detect the frequency modulation present in the 4.5-mc. wave, and the audio output is fed to audio amplifier and loudspeaker. —ELECTRONICS

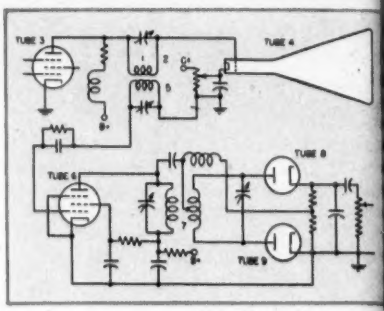



Diagram of the carrier-difference sound system for television receiver. The f-m sound carrier is taken direct from the picture tube grid.

## ROLLER CONVEYOR SYSTEM DOUBLES PRODUCTIVITY

Placement of gravity roller conveyor from railroad-siding door, past three table-type radial saws in production-line sequence has increased production of studding for prefabricated houses from 960 to 1,710 studs per man per day. Cost of cutting studs, rafters, and joists from a carload of 30,000 bd. ft. of lumber was reduced from $300 to $90; waste lumber was cut from 10% to one-tenth of 1%; handling costs were cut from $4 per 1,000 bd. ft. to $2.

Railroad car is spotted at foot of conveyor, one man unloading car, second man placing lumber on conveyor. Three sawyers, spaced to handle varying lengths, cut lumber to desired length and shape, then move lumber down roller to stacker. —FACTORY

### Strikes Delay Digest

*Two recent issues of McGraw-Hill Digest were late in reaching readers because of maritime and trucking strikes. A few subscribers may not have received the copies at all. If you did not, please notify us. We shall send replacement copies if our supply is not exhausted. — The Editors*

## DIAMONDS CUT PLASTICS WITH PRECISION

Resistance to abrasion, low heat generation, and capacity to hold keen cutting edges on long runs make diamond tools effective and practical in machining plastics. Present wide usage is in part due to large quantity of industrial plastic parts requiring greater accuracy than ordinarily obtained by molding. Maintenance of keen cutting edges on steel tools is made difficult and expensive by the highly abrasive character of many plastics and their fillers.

Precision cutting of plastic parts requires previous aging of 24 hr.; for ultimate in accuracy, as much as 6 weeks.

A good machined plastic surface will be smoother than average molded surface, but light buffing is required in some cases. —AMERICAN MACHINIST

## 2- AND 3-PHASE POWER FROM SAME SYSTEM

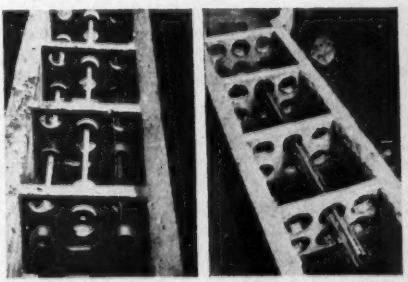
A new multiple-phase electrical distribution system permits Sherwin Williams Co. to maintain production with 2-phase equipment while gradually converting to 3-phase. The scheme consists of adding one single-phase transformer to each of four existing Scott-connected transformer banks. To each of the secondary, radial type, 2-phase, 4-wire underground feeders is added a single cable, making a 5-wire secondary distribution system emanating from the transformer substations. This connection, in effect, provides an open-delta, 3-phase secondary, while still maintaining 2-phase, 4-wire system. Middle transformer carries 2- and 3-phase loads. —ELECTRICAL CONTRACTING

## JOINS METALS, NONMETALS

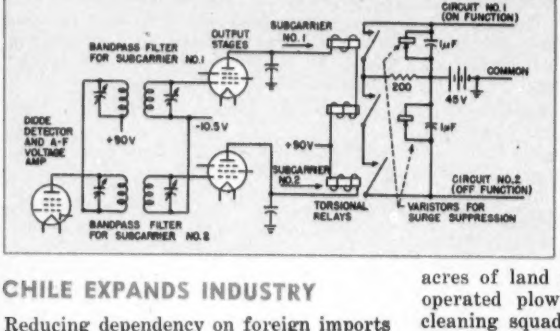
Cyclewelding, developed jointly during the war by Chrysler Corp. and Goodyear Tire & Rubber Co., uses a phenolic substance and synthetic rubber resin for bonding metals and nonmetals in almost any combination. The adhesive, a cement, is brushed or sprayed on surface, the faces being held together under pressure or heat and pressure. Strength of bond is greater than that of normal cements, but is weaker than that of metal welds. Chrysler is using cyclewelding to join brake bands to shoes. —BUSINESS WEEK

## ENGINE MACHINES WHEELS

To reface worn tires on a diesel-electric locomotive at Truax-Traer Coal Co. mine, the locomotive turns its wheels against a Carboloy cutting tool. Mine-designed turning equipment eliminates need for extra truck or spare locomotive, does the job in 8 hr. on two wheels of each truck. Locomotive frame is jacked up until tires clear track. Journal box covers are opened, end-play thrust brasses removed. Centering frames are bolted to boxes, truck being held in fixed position in relation to journal box but free of rail to rotate. A bar, perpendicular to rails, is clamped by plate and cap screws, and cutting tool is bolted to one end of bar. Engine is started at slow speed, brakes set slightly to steady motion. —COAL AGE



LOW-COST CONDUIT—Instead of being in continuous conduit, cable is supported at about 20-in. intervals in a new type of patented conduit construction used by the telephone company in Venice (Societa Telefonica delle Venezie). The cable passes through holes in reinforced concrete diaphragms with insulating-ring inserts. Duct sidewalls are poured in forms after the diaphragms have been placed and aligned. A "basket" of flat straps (right) is fed into the holes ahead of the cable to facilitate drawing. After cables are installed, reinforced concrete covers are placed and excavation backfilled. Advantages claimed are low cost, speed, easy inspection, less strain on cables during installation because of less friction, drainage to keep cables dry. —ELECTRICAL WORLD




**CONTROLS BUOYS**—Radio receiver with frequency-selective torsional relays controls navigational aids such as fog horn and electric bell strikers. Receiver responds to signals from a vhf shore transmitter employing two supersonic subcarriers pulsed at different rates. Two relays are used to turn the lights on, one to turn them off. Audio output circuit of superheterodyne receiver used on the buoy is shown at left. —ELECTRONICS

## CHILE EXPANDS INDUSTRY

Reducing dependency on foreign imports and increasing home production, Chile's industrial expansion program, to be completed in 1951, will effect a $40,000,000 a year savings on foreign exchange. During the past year, the Corporacion de Formento de la Produccion completed and put into operation a cement plant, tire factory, linen thread mill, copper mill, and an electric motor factory, most of the equipment being imported from the United States.

Future plans call for the construction of power-plant facilities totaling 750,000 hp. An oil refinery of 10,000-bbl.-per-day capacity is to be built in the Santiago-Valparaiso area, a smaller one near Magallanes. A flax-spinning mill of 240,000-kilos capacity and a hemp-dressing plant of 2,000-ton capacity will be imported. Products will be sold locally.

Finished steel output will reach 150,000 tons initially, 450,000 tons eventually, with construction of a $53,000,000 steel mill. Copper wire and cable plants will produce 90% of Chile's copper needs. Tire factory output will be raised from 70,000 a year to 100,000 a year. Long-range reforestation will increase the country's timber wealth about $32,000,000 in 15 years. Four saw mills, a creosote plant, a sulphite plant, a pressed-wood plant, two prefabricated-house factories, and lumbering mechanization will be undertaken.

Mechanized cultivation of 1,200,000 acres of land is expected. Government operated plow teams, harvesters, root cleaning squads, and tractor teams will handle 200,000 acres annually. Another 200,000 acres will be irrigated. Sugar beet production will be stepped up and a plant constructed to handle from 600 to 1,000 tons a day. —BUSINESS WEEK

## BETTER TEST FOR POLLUTION

Present tests for pollution of water and food often are unsatisfactory because they are based upon detection and estimation of coliform bacteria. These may be of soil or vegetable origin, and of no sanitary significance. A new test is for enterococci found only in intestinal contents of man and animals, and is more certain. The test is based upon use of sodium azide and 45°C. incubation for 7 to 12 hr.

Growth of enterococci is subsequently verified in 12-18 hr. by sediment formation in broth and typical colonies on surface of a slant-broth preparation. Selectivity of the medium is due to sodium azide, methylene blue, and penicillin. Gram-stain and catalase test provide further proof. —FOOD INDUSTRIES

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